SCIENTIFIC AMERICAN

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NEW COMPOUND LOCOMOTIVE.

Without doubt, one of the most important engineering questions of the day is that of the economical use of steam. This has been a great problem since the days of Watt, and while from his time on gradual improvement had been made in the construction of steam engines and in the methods of generating and utilizing steam, the greatest strides have been made within a few years by compounding the engines and using the steam expansively to the greatest possible extent.

In marine engineering, where the condenser could be applied to great advantage, very high duty has been realized, and in the more recent ocean steamers the improvements as regards power are fully as great as the improvement in those details of naval architecture relating to speed. It has been found that non-condensing compound engines could be constructed with great advantage, and many stationary engines of this type are now in use for various purposes, notably for use in connection with dynamos for electric lighting. Quite recently, the same principle has been applied by the Rhode Island Locomotive Works to a passenger locomotive. Our engraving represents this engine during the experimental stage, showing the engineers taking indicator diagrams from the cylinders. With the exception of the high and low pressure cylinders, and the mechanism peculiar to them, the locomotive is of the regular type made by the works before mentioned. The high pressure cylinder is 18 inches in diameter, with a stroke of 24 inches. The low pressure cylinder is 28 inches in diameter, with the same stroke. The driving wheels are 78 inches in diameter; the barrel of the boiler is 52 inches in diameter, and the thickness of the steel plates of which the boiler is made is $\frac{5}{8}$ inch. The normal steam pressure is 180 pounds per square inch. Steam is admitted to the high pressure cylinder in the usual way by a link and valve motion, and exhausted into an intermediate receiver, E, from which it is admitted to the low pressure cylinder by means of the intercepting valve shown in Figs. 1 and 2. This valve is constructed on the differential principle, and being entirely automatic in its action, it does not in any manner increase the work of the engineer.

Fig. 2.

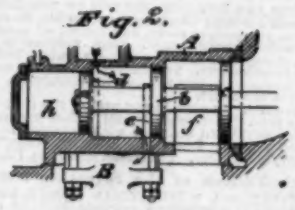
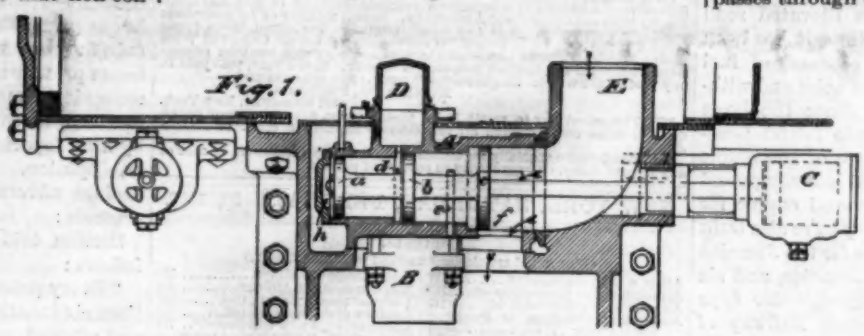
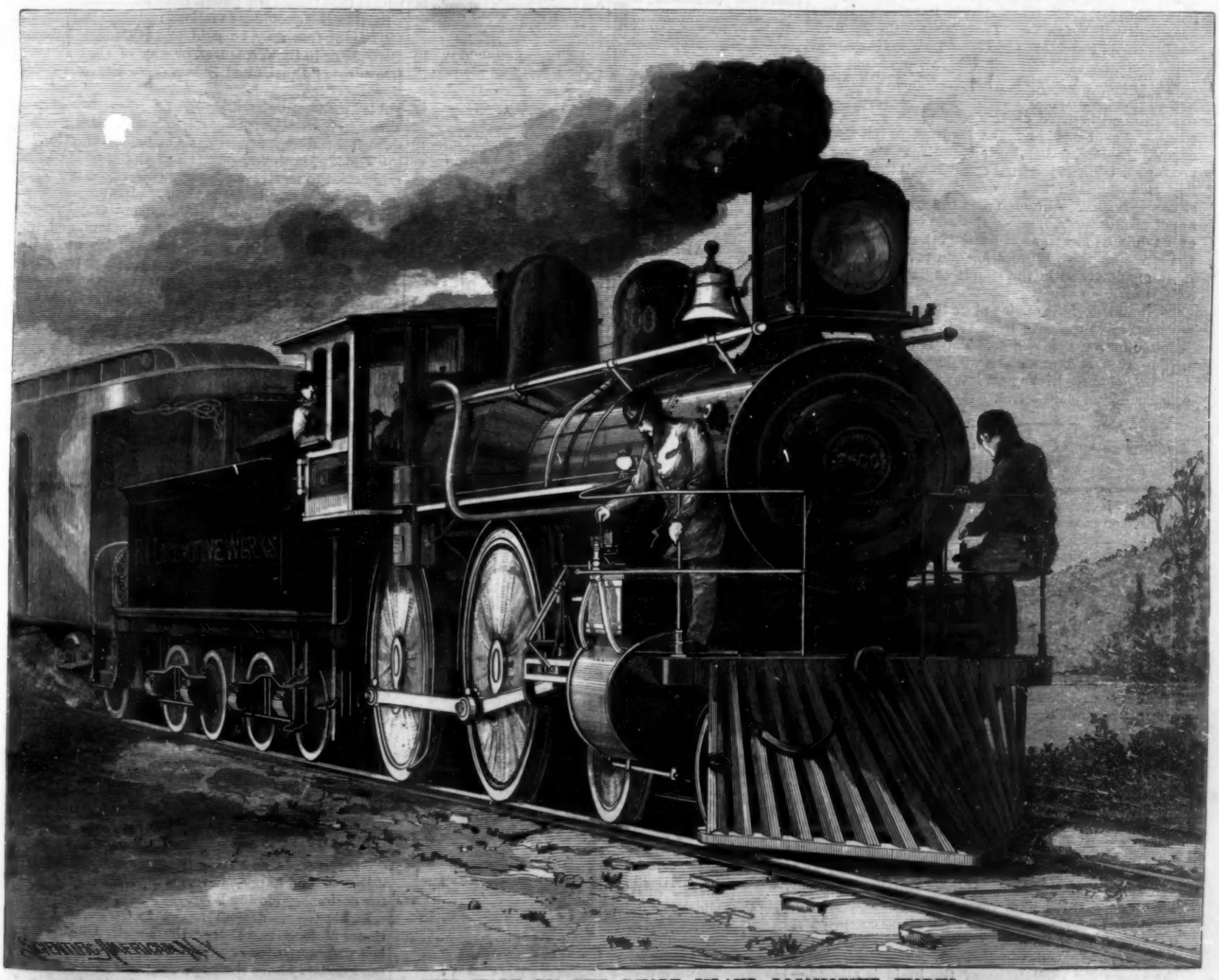


Fig. 1.



THE INTERCEPTING VALVE.

The intercepting valve being in any position (that shown in Fig. 1, for example) and the throttle valve being opened, steam passes directly from the boiler to the high pressure cylinder in the usual manner. It also passes through the pipe, D, into the intercepting valve, A, causing the piston to move into the position shown in Fig. 2. In this position, the receiver, E, is closed to the low pressure cylinder by the piston, *c*, and steam from the pipe, D, passes through the ports, *d* and *e*, and through the reducing valve, B, into the low pressure steam chest, the pressure being reduced by the valve, B, from boiler pressure in the ratio of the high and low pressure cylinder areas. The piston, *a b c*, is so proportioned that it will automatically change to the compound position when a pre-



COMPOUND LOCOMOTIVE MADE BY THE RHODE ISLAND LOCOMOTIVE WORKS.

determined pressure has been reached in the receiver, E, by exhausts from the high pressure cylinder, as shown in Fig. 1. The engine thus starts with steam in both cylinders, and automatically changes at a certain receiver pressure, so as to work on the compound principle.

The engine may be changed from the compound system to the simple system at any time at the will of the engineer, by opening a valve connecting the receiver with the exhaust pipe, and allowing the exhausts from the high pressure cylinder to be ejected through the exhaust nozzles in the usual manner.

The apparatus is so constructed that the operation of the exhaust valve permits steam at the receiver pressure to enter into the space, *h*, to insure the movement of the piston to the position shown in Fig. 2, before the receiver is emptied through the exhaust. This prevents a lapse of continuous action in the low pressure cylinder during the change from the compound to the simple system while running. It is obvious that under bad conditions of starting the engine may be operated as a simple one, at the will of the engineer, by opening the exhaust valve before starting. Whenever this valve is closed, the piston, *a b c*, will automatically take the compound position shown in Fig. 1.

It is also obvious that an engine of this kind makes but two exhausts into the air, when running as a compound, for each revolution of the drive wheels, instead of four, as usual.

This engine is the second of the kind, the first having been placed on the Brooklyn Union Elevated road more than a year ago, since which time it has been working satisfactorily and with great economy of fuel and oil, besides running with much less noise and without throwing cinders and sparks. Since the large engine here shown was built, the Rhode Island Locomotive Works have changed two more of the simple engines of the Brooklyn Elevated road into compound engines, and have built one new compound engine for the Kings County Elevated road. They have also built a large ten-wheeled compound engine for the Jamaica Railway Co., to run on the island of Jamaica, and six very heavy freight engines of the four-cylinder type of compound, for the Mexican Central Railway of Mexico.

The large engine which we illustrate was designed for making fast time on trains with few stops. It has been used on the New York, Providence & Boston Railroad between Providence and New London, in general service on heavy and fast trains. By a comparison with simple engines of practically the same dimensions every way, it has been found that in point of cleanliness, that is, freedom from cinders and black smoke, the compound engine is in marked contrast to the simple engine. In fact, it has been found that this engine needs no netting at the front end. It will thus be seen that this engine settles the question of the cinder and smoke nuisance. Although the bearings or journals are of ordinary size, none of them on this engine have ever exhibited any signs of heating, thus showing that the stress on the reciprocating and revolving parts is more regular than in the simple engine exerting the same power.

The builders of the engine place the saving of fuel on a conservative estimate from 15 to 25 per cent of that required for a simple engine. This is certainly a surprising gain, and one which would seem to indicate that we are to see in the near future a revolution in the construction of locomotives.

Compression of the Carotid for Convulsions.

Dr. Leopold Roheim, of Budapest, publishes in the *Gyogyaszat* a case of eclampsia which he had, after the failure of all ordinary remedies, successfully treated by compression of the carotid. The case, which is quoted by the *Pester Medicinisch-Chirurgische Presse*, was that of a robust man of fifty-six, who had been suffering for years from cancer of the bladder, with occasional hæmaturia. The man had been attacked by a most violent eclamptic paroxysm, which was mainly confined to the left side. Dr. Roheim prescribed in vain musk, valerianate of zinc, bromide of potassium, asafœtida, hypodermic injections of morphia, enemata of hydrate of chloral, and frictions with mustard, and at last employed compression of the carotid. After constant compression for some time of the right carotid the convulsions were suddenly arrested, the patient recovered normal respiration, and very soon felt quite well. Two or three slighter attacks followed, which were soon arrested by properly instructed attendants. The effect of the compression was so remarkable that Dr. Roheim earnestly recommends this treatment. He compressed the carotid with the index and second fingers between the larynx and sterno-cleido-mastoid muscle backward toward the spine, just as Trousseau and Blaud had recommended. He was equally successful in the case of a girl nine years old. He considers the *rationale* of the treatment to be that by compressing the carotid and at the same time necessarily the sympathetic nerve fibers, which closely follow the course of the artery, the excitability of the brain is allayed.—*Lancet.*

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BELATED INVENTORS.

By the terms of the existing law the official fees for a patent are fixed at $35, payable in two installments; the first, $15, on filing the application for the patent; the second, $20, after the application has been officially examined and favorably passed upon or "allowed."

The applicant has six months time, after the allowance, within which to pay the final fee of $20. If not paid, the application is forfeited, and the only way then to obtain the patent is to file a new application and pay a new government fee.

Many inventors are poor, and are obliged to search for financial aid. As a rule, they are not good business men. They often postpone the final payment as late as they can, sometimes even up to the last hour. If living at a distance, the mail may be delayed and not reach Washington until after the business hour of the Patent Office; or the telegram may fail to arrive in time.

When the money comes to hand, after the official closing hour of the office, it has heretofore been customary for the applicant's agent to place the funds in a sealed envelope and hand it, at the door of the Patent Office, into the custody of the watchman in charge; who in turn passes it over the next morning to the official receiving clerk.

These payments, although made after office hours, are still made within the six months time allowed, and have been accepted, heretofore, as a technical compliance with the law.

Two cases of payments in this manner were lately brought to notice of Commissioner of Patents Simonds, in one of which the $20 fee was delivered to the watchman five minutes before midnight and the other four hours prior to midnight. The Commissioner refused to recognize the legality of the proceeding and the matter was sent to the Secretary of the Interior, and by him reported to the Attorney-General's office for an opinion. Assistant Attorney-General Shields decides adversely to the inventor, on the following grounds:

Section 4885 of the Revised Statutes provides as follows:

"Every patent shall bear date as of a day not later than six months from the time at which it was passed and allowed and notice thereof was sent to the applicant or his agent, and if the final fee is not paid within that period the patent shall be withheld."

Section 4935 provides as follows:

"Patent fees may be paid to the Commissioner of Patents, or to the Treasurer, or any of the assistant treasurers of the United States, or to any of the designated depositaries, national banks, or receivers of public money designated by the Secretary of the Treasury for that purpose, and such officer shall give the depositor a receipt or certificate of deposit therefor."

"The law, however, points out the specific officers authorized to receive such payments, and none other has any authority to act in the premises."

"It is in effect claimed that payment may be made to any officer or employe of the government, and this in the face of the specific provisions of law as to the places and persons, where and to whom such payments are to be made. The mere statement of the proposition without comment or argument is sufficient to show that it cannot be seriously entertained."

"It is further alleged that it has been the practice, well understood by those interested in the matter, to accept fees handed to the watchman at the door of the interior department building, as these fees were, after office hours or upon holidays, and to credit them as paid on the day they were handed to such watchman. There is no authority for such a practice, and if it has been allowed, the sooner it is discontinued the better. The policy of allowing any employe not under bonds to become a receiver of money is a dangerous one and should not be countenanced, even though it be not forbidden by the law."

"As a legal proposition, the decision of the Commissioner that this payment was not one under the law is, in my opinion, entirely sound."

"The law," says the Attorney-General, "points out the specific officers authorized to receive such payments, and none other has any authority to act in the premises."

This cannot mean that the receiving officer must personally stand at the counter and take money; but he may provide clerks and assistants to do it for him.

Furthermore the patent law expressly authorizes the Commissioner of Patents to make, subject to approval of the Secretary of the Interior, such lawful rules for doing business with the Patent Office as he thinks proper.

It is, therefore, within the sphere of the Commissioner to make a special arrangement to accommodate belated inventors and save them from loss of standing on the records, and from the forfeits and extra costs, if they should happen to reach the Patent Office after the customary closing hour.

In his recent annual report to Congress, Commissioner Simonds stated that the Patent Office receipts last year were over one hundred and thirty-one thousand dollars above the expenses; and that a little over four millions of dollars were now standing in the

treasury on account of the Patent Office fund, all of which was paid in by inventors. In the same report the Commissioner dwells at considerable length and with much eloquence upon the immense benefits conferred upon the country by patentees. Among other things, he says:

"There is no class or condition of men in the whole country which has not felt the blessings of American inventive genius, fostered into its fullest flower by wise and kindly patent laws."

As coincident with these generous sentiments we hope the Commissioner will do something practical by way of relief for the belated inventors. The effect of his recent ruling has been to drive them from the doors of the Patent Office, without remedy.

By a few strokes of his pen and without detriment to others, he can make a new and kindly rule that will assist them.

It is not asked nor to be expected that the Commissioner will personally remain at his office until 12 o'clock at night to receive fees; but it seems not an unreasonable request for inventors to make that he will authorize the expenditure of five hundred or a thousand dollars a year for the employment of a clerk whose special duty shall be to be present at the door of the Patent Office from 4 P. M. (the usual closing hour) until 12 o'clock P. M., for the express purpose of saving cases that must otherwise be forfeited. If this is not desirable, then some other way surely ought to be provided to receive the anxious applicants' money, if presented even so late as the fraction of a second before the limit of time specified in the law.

EXCLUSION OF PHOTOGRAPHS FROM THE INTERNATIONAL POSTAL EXCHANGE.

Mr. Herbert Spencer, during his last visit to this country, felt called upon to speak to us some pessimistic yet wholesome words of caution relative to our intense love for the least permanent but most showy advances in social government. Yet, quick to see the good in us, he spoke most hopefully of that phase of our life which both enabled and impelled the man in the middle walks to surround himself with those literary, musical, and art luxuries which still remain far out of the reach of most Europeans. In his trip through the United States, during last year, the Earl of Rosse gave it as his opinion that the most observable manner in which the American citizen was differentiated from the subjects of European powers was in the way in which he was able to live; the appearance of solid comfort, even luxury, with which it was possible for the artisan, for example, to surround himself. As the chief cause contributing to this condition, beyond that of the boundless wealth of our territory, he recognized the great inventive and resourceful qualities of "the Yankee mind"—qualities that keep busy a small army of experts and their clerical forces examining, classifying, and passing upon a multitude of improvements in mechanisms and processes such as no other country can show.

To electricity, with its glittering triumphs over time and space, and to steam, with its boundless energy, are usually given the dual honors of first mention when this century's advance in material prosperity is under consideration. The more regular and far more constant progress made in the graphic arts is generally overlooked in this discussion; yet in no way are we today further removed from the life of the early part of this century than in our improved facilities for enjoying, in our own homes, the reproductions of the earth's chief art treasures, or of nature's beauty and grandeur. The wonders of the Yellowstone, the dread gloom of the trackless African forests, the terrors of the Alaskan avalanche, the untrodden sublimities of the upper Himalayas, are brought to our library tables, and we commune with the powers of nature, thus shown forth with almost the same sense of mental elevation which our actual presence among them would produce. To-day we may, if we will, become more familiar with the racial characteristics of face and form of the man of the Kilima-Njaro mountains, or the Patagonian wildernesses, than were our grandfathers with those of civilized Europe. To the camera and all that troop of following processes which have so improved and, at the same time, cheapened the reproductive graphic arts, are we mainly indebted for these enrichments of our library tables, our book shelves, and our walls.

Anything which is calculated to take from the public the immediate benefits accruing from such progress, a progress in which America has borne a prominent part, or any governmental action or restriction which shall add to the difficulty or cost of enjoying the educative results thereby brought about, is an unmixed evil. So when Mr. Secretary Foster, of our Treasury Department, promulgated his recent order excluding photographs from the mail exchange, a blow was aimed at one of the sources of public culture.

This ruling of the secretary is based on the provisions agreed upon by the Universal Postal Union Convention, as quoted in the *General Regulations under the Customs and Navigation Laws of the United States*, 1884. Article 308, which reads as follows:

"The sending by mail of letters or packets containing gold or silver substances, pieces of money, jewelry, or precious articles, or any packets whatever containing articles liable to customs duty is prohibited."

Article 310 of these regulations provides for the admission of books "to the International Mail Exchange, and imported through the mail under the act of March 3, 1879," but only books are therein specified. The secretary's contention is that the previous admission of such articles, now so long permitted, has been illegal, and he has instructed his assistants at the various ports of entry that only "on payment of a fine equal to and in lieu of the duty which would have accrued thereon had importation been legal" can such a package be delivered. If Secretary Foster be right, and the respectable line of his predecessors have permitted an infringement of law in the past, then the time is ripe for bringing the matter before the present Congress. A slight amendment of the law, to wit, the insertion of two words, "and photographs," after the word "books," would be greatly to the advantage of the people.

The Production of Aluminum.

Taking into account the development made by the factories of aluminum in recent years, it may well be believed that the production almost equals the demand, although new uses for this light but ductile metal are being daily discovered.

The *Bulletin de Musée Commercial*, in a recent number, reviews the productive capacity of the principal aluminum factories now in operation. Since the closing of a large number of European works, by reason of the difficulty they experienced in competing with the electrolytic process, the manufacture of aluminum is at present confined to four large factories. The most important is the Aluminum Industrie Actien-Gesellschaft, at Neuhausen on the Rhine, the daily production of which is about 1,000 lb. of metal. Then comes the Pittsburg Reduction Company, with a daily production of 600 lb.; the Metal Reduction Syndicate, Limited (English branch of the Pittsburg manufacture), with 300 lb. daily; and finally, the Cowles Company, which has a daily production of from 600 lb. to 700 lb., but of which the greater part consists of alloys of aluminum. It is thus seen that the present production of aluminum in the world only amounts to about 2,600 lb. daily.

Hitherto the largest quantity of commercially pure aluminum seen at one time consisted of a stock of about 19 tons, to be found recently in the warehouses of the Pittsburg Reduction Company. Then may be mentioned, in order of importance, the Paris Aluminum Company, which ceased its operations at the commencement of 1890 with a stock of 10 tons; the Alliance Aluminum Company, of Newcastle, and the Aluminum Company, Limited, of Birmingham, which possessed, at the time of the closing of their works, stocks of 8 and 6 tons respectively.

Toward the middle of last year American aluminum was quoted at the rate of $2 per lb.; some few months later the price was reduced to $1 per lb. The present prices of the Pittsburg Reduction Company are: For No. 1 quality, 90 cents per lb. in small quantities and 75 cents per lb. for orders of at least one ton; for No. 2 quality, of a purity of from 94 to 97 per cent, 65 cents per lb. for quantities of not less than a ton.

On the other hand, it is stated that a French company has just erected an establishment at St. Michel (Savoy) for the manufacture of aluminum by the Minet process. This process is based on the electrolytic treatment.

The Real Inventor of Telegraphy.

According to a writer in the *Popular Science Monthly* for February, Weber was the first who established a permanent workable telegraph line, and thereby demonstrated the practical value of the electric telegraph. Weber's house in the city was connected with the astronomical and magnetic observatories by a line between three and four kilometers (over two miles) in length. The signals were made by the deviations of the needle of a galvanometer to the right and left, and were interpreted according to a conventional alphabet. The use of interrupted or reversed currents did not permit the transmission of more than one or two words a minute, but the speed was increased to seven or eight words by the use of induced currents. The following first notice of this telegraphic connection was published in one of the numbers of the *Gottingen Gelehrten Anzeigen* (or Gottingen Scientific Notes) for 1834: "We cannot omit to mention an important and, in its way, unique feature in close connection with the arrangements we have described [of the Physical Observatory], which we owe to our Professor Weber. He last year stretched a double connecting wire from the cabinet of physics over the houses of the city to the observatory; in this a grand galvanic chain is established, in which the current is carried through about nine thousand feet of wire. The wire of the chain is chiefly copper wire, known in the trade as No. 3. The certainty and exactness with which one can control, by means of the commutator, the direction of the current and the movement of the needle depending upon it were demonstrated last year by successful application to telegraphic signalizing of whole words and short phrases. There is no doubt that it will be possible to establish immediate telegraphic communication between two stations at considerable distances from one another."

Electrical Tanning.

The London *Boot and Shoe Trades Journal* describes the results of two experiments in tanning by aid of electricity, by "Groth's system," carried out at the tannery of George Hauenstein, at Verviers, Belgium:

The apparatus used in these experiments consisted of a rectangular wooden vat, 6 feet 6 inches long, 4 feet 10 inches wide, and 5 feet 3 inches high, with two electrodes, framework and shafting, the cost of which was £30 7s. 6d., together with a dynamo, ampere meter, volt meter and shafting, costing £24; or, altogether, £54 7s. 6d. This electric installation is capable of supplying electricity to six vats or pits.

Forty ox and cow hides from the Brussels abattoir were experimented upon, weighing, without the horns, 1,380 kilogrammes. These hides, after having been put in lime, unhaired and fleshed, were swelled and colored. The forty butts derived from these hides were hung up in the vat on the 12th of October and taken out on the 16th of November; they were subjected to the action of electricity during four weeks, or twenty-four days, from six to seven hours per day, and the weight yielded, when finished and dry, was 379 kilos.

The offal, bellies, throats and heads, hung up in the vat on the 16th of November, were taken out on the 7th of December. The parts were, therefore, subject to the action of electricity during three weeks, or eighteen days, from six to seven hours per day, and the weight yielded, when finished and dry, was 344 kilos.

The forty hides, therefore, with a green weight of 1,380 kilos., gave a total weight of finished leather of 723 kilos., or 52·4 per cent.

The tanning material employed to swell, color, and tan these forty hides was as follows: 880 kilos., of oak bark, costing 15 francs per 100 kilos., equal to £5 5s. 6d.; 85 kilos. of mimosa bark, at 40 francs per 100 kilos., equal to £1 7s.; 400 kilos. of oak extract, at 40 francs per 100 kilos., equal to £6 8s. This makes a total of £13 6d. for tanning 723 kilos. of leather, equal to 45·2 centimes per kilo., or 2¼d. per pound of leather.

The *Journal* adds:

At the Crystal Palace Electrical Exhibition there is much to be seen of great interest, but to us and our readers nothing of more interest than attaches to L. A. Groth's exhibit of various kinds of leather tanned by the aid of electricity. Mr. Groth's interesting exhibit consists of diagram of "complete tannage" in fourteen days of "green hides," each averaging 77 pounds weight, showing their daily absorption of tannin from the liquor, ascertained by analyses made on samples taken from the hides and liquors every two hours during the whole time of the tannage, and showing that as soon as the hide has been tanned, no more tannin can be absorbed by it, even if kept in the liquor for ever so long.

Another diagram shows the comparative tannages, viz., with and without the aid of electricity, and demonstrates not only that electricity bears an important part upon the hastening of the tanning process, but also distinctly shows to what degree the electricity so acts.

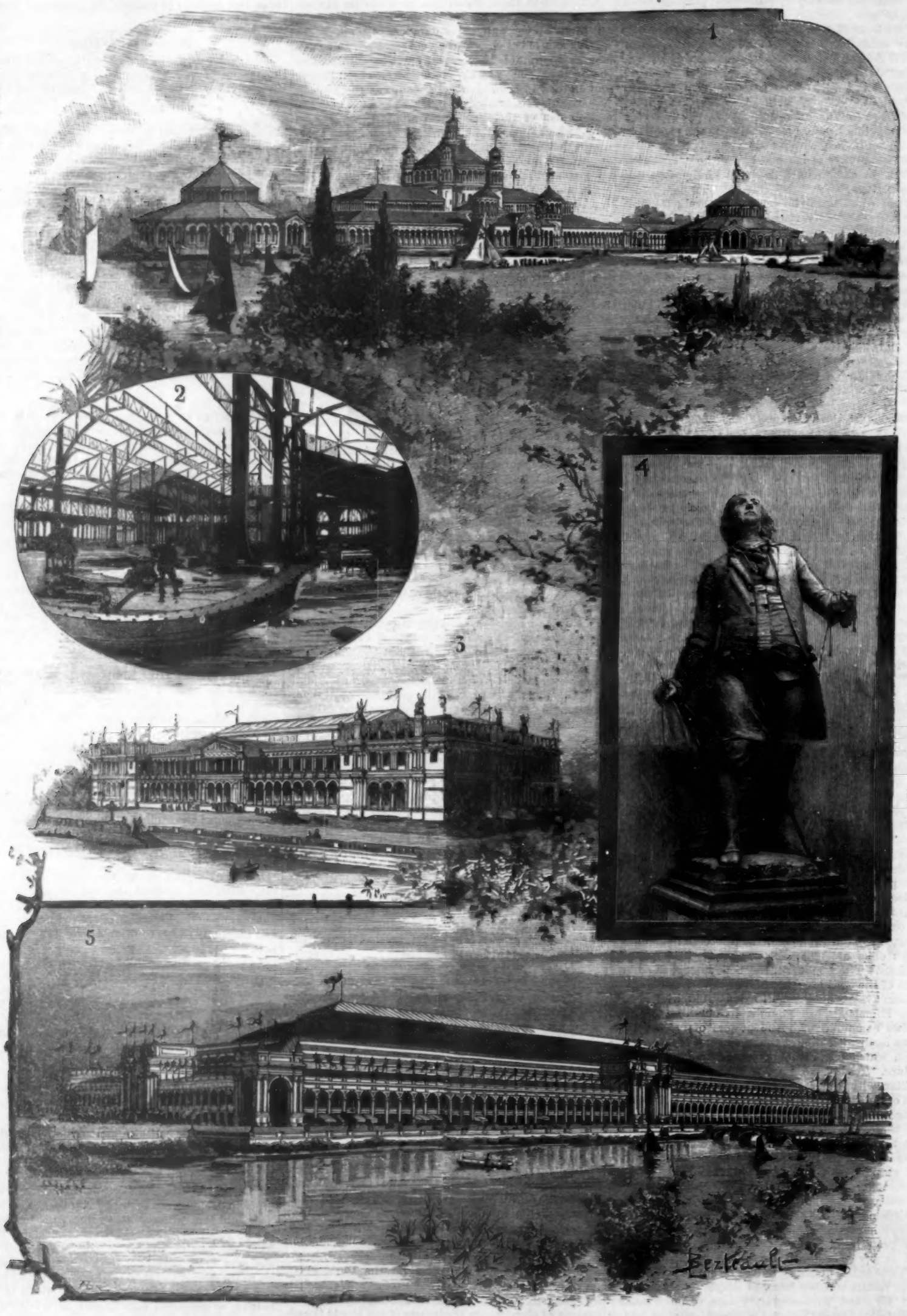
As to the products exhibited by Mr. Groth, there are several "sole butts" tanned by him in four weeks. The color is good, the leather firm, and the finish very clear. To further show the quality of this leather, several pairs of boots made from the same are exhibited. An old pair of boots is also exhibited, with the right sole made from Groth's one month's tannage and the left from leather tanned in eight months by the old process, and constantly worn for six months by a person said to weigh 12 stone, in order to show the small wear of Groth's leather, as compared with first-class leather—the wear being equal in both.

There are some calfskins tanned in fourteen days.

The belting made from Groth's leather, tanned in four weeks, seems also to be of first class, and the very samples tested by Professor W. C. Unwin, F.R.S., of the Central Institution, London, are also exhibited, in order to demonstrate their peculiar breakage, being in a straight line, whereas the ordinary belting generally breaks raggedly, which says a good deal for the uniform tannage of Groth's leather. Professor Unwin also says, in his report: "The leather generally is quite up to the strength of good leather intended for belting," and "the tenacity in this per inch of width of Groth's belting, as compared with English, is as follows:

	English.	Groth's.
Maximum	1,272	1,318
Minimum	616	848
Mean	964	1,022

We would advise our readers to have a look at Mr. Groth's exhibit, which will doubtless prove not only interesting, but instructive and valuable from a trade standpoint.



THE WORLD'S COLUMBIAN EXPOSITION.—ENGRAVINGS FROM "L'ILLUSTRATION."

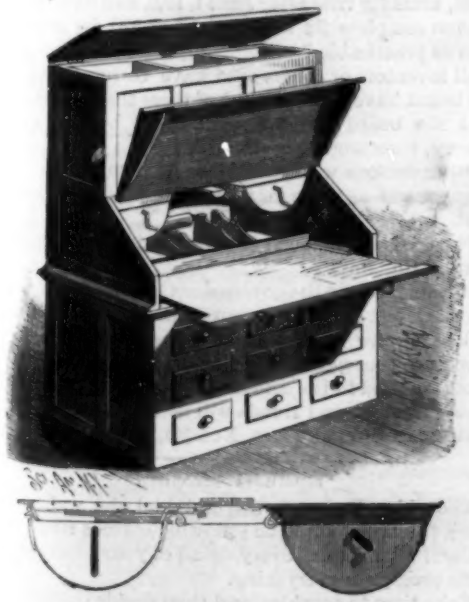
1. The Pavilion of Fisheries. 2. Erection of the Electrical Building. 3. The Woman's Pavilion. 4. Statue of Franklin. 5. Palace of Manufactures and Industrial Arts.

Iron-Aluminum Alloys.

The advantages of an addition of aluminum to fluid iron are important. With moderate care absolutely pure and solid castings can be obtained capable of receiving a high polish. An addition of aluminum is especially to be recommended for the manufacture of steam cylinders, engine castings, press cylinders, and generally for castings which are to be subjected to a high pressure. A few hints will serve to show how aluminum is best alloyed with iron. As aluminum only lends itself with difficulty to combination with iron, it is not immediately to be introduced in the ladle which is to be poured into the mould; a smaller ladle is selected, in which is placed the heated aluminum; somewhat fluid iron is brought from the furnace, poured in the ladle, and stirred until the aluminum-iron compound begins to stiffen. The iron intended to be cast is now let out of the furnace into the ladle intended for it; the aluminum-iron mixture is poured in, the lot being intimately mixed. The molten metal should not be poured into the mould too quickly, as it does not solidify so rapidly as ordinary iron. Aluminum-iron in the fluid condition is very active; small globules are formed, which gradually extend to the edge of the ladle, where they disappear. At first the iron is of a milk white color; then it becomes orange yellow, and forms a thin film on the top. When this moment has arrived, the film is removed and casting is proceeded with, care being taken that the mould is always kept full. For 100 kilogrammes the proportion of aluminum recommended is 200 grammes. Cost can be no drawback in view of the present cheapness of aluminum, particularly when it is considered with how much greater certainty clean castings can be obtained. Aluminum improves cast iron as phosphorus improves tombac and brass; the thin fluidity is increased and the oxide separated.—*Metallarbeiter.*

A CONVENIENT KITCHEN CABINET.

The cabinet shown in the illustration is adapted to contain nearly or quite all the articles commonly used in cooking, so arranged as to be protected from dust, and all within easy reach. For this improvement a patent has been allowed Mr. Charles Holt, of Walla Walla, Washington. The lower or base portion of the cabinet has a large number of drawers suitable to hold various articles or utensils, and this base carries on its top a sliding kneading board, readily pulled out for use and pushed inward when not needed. The top part of the cabinet is entirely removable, having recesses in its bottom portion which fit upon corresponding lugs on the top of the base, while a swinging lid closes down over the kneading board. The top part is divided by vertical partitions into compartments, preferably three in number, the two end compartments for different qualities of flour and the center one for sugar. Immediately below the compartments is a hollow framework with depending flanges supporting a sieve under each flour compartment, as shown in the sectional view. Plates serving as floors to the flour compartments each carry a slide with an inwardly ex-

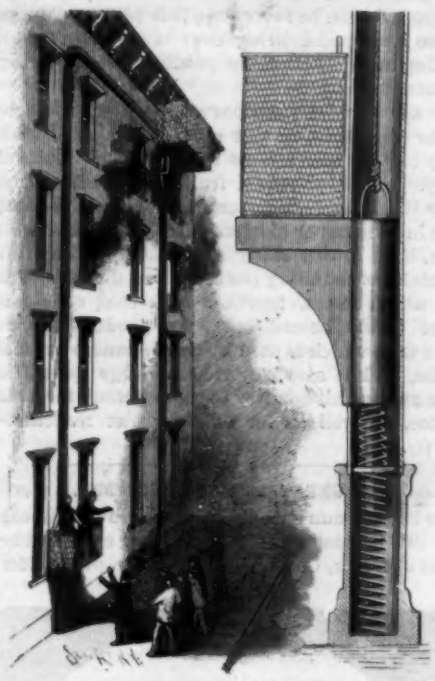


HOLT'S KITCHEN CABINET.

tending rod terminating in a knob, on pulling which the flour is permitted to drop to the sieve below, the sieves being so secured in place that they may be removed from the frame by pulling downward upon a spring catch. Within each sieve is a swinging wire rod loop, the rod extending through the front of the sieve, where it is formed into a crank, by turning which the flour will be passed through the sieve. Centrally between the sieves is a cross plate forming the floor of the sugar compartment, and in this plate is a slideway in which is a hole adapted to register with a hole in a slide, by moving which the sugar is allowed to flow through. Beneath the central compartment is a bin to receive the sugar, and on each side are smaller bins for baking powder, spices, etc., there being larger bins near the ends for the flour. A rolling pin, when not in use, may be kept on top of the bins. The entire sifting and regulating mechanism may be easily removed to be repaired or cleaned.

AN IMPROVED FIRE ESCAPE.

The construction shown in the accompanying illustration is designed to be of a simple, durable, and inexpensive character, and adapted to be placed at the side



SCHWANNECKE'S FIRE ESCAPE.

of a building without detracting from its appearance. It forms the subject of a patent which has been issued to Dr. Henry Schwannecke, of No. 1280 Fulton Avenue, New York City. The improvement consists essentially of two chairs or balconies, so connected that when one descends the other will ascend, the descent of the balconies being stopped at the bottom by spring cushions, so that the occupants will experience no shock. Two tubular standards are located at any desired point upon the building, connected at the top by a transverse tubular slideway, and each standard has a hollow base in which is located a coil spring, as shown in the sectional view. Each standard has in its front face a vertical groove extending from the base to the top, and a bar sliding in the standard has a flange or projection extending out through the groove, to which the chair or balcony is securely attached in any approved manner. The bars carrying the chairs have reduced lower ends, around which are springs carrying disks adapted to enter the hollow base of the standard, this arrangement preventing any rebound, while forming a thoroughly effective cushion for the chair in its descent. The chairs or balconies are connected by a cable, the ends of which are attached to the upper ends of the bars, the cable passing through the standards and over pulleys through the upper slideway. Each balcony has a brake, whose handle extends up within convenient reach, the shoes of the brake being normally held against the standards by a spring, and near the top of each standard is a keeper, adapted to engage and lock the brake shoe when the chair is in its most elevated position. Upon persons entering the upper chair, and disengaging the brake from the keeper, the chair descends by gravity, the other chair at the same time ascending to receive others desiring to descend.

The Harvard Astronomical Station in Peru.

Dr. Edward C. Pickering, director of the Astronomical Observatory, Harvard College, in his last annual report, gives the following interesting information:

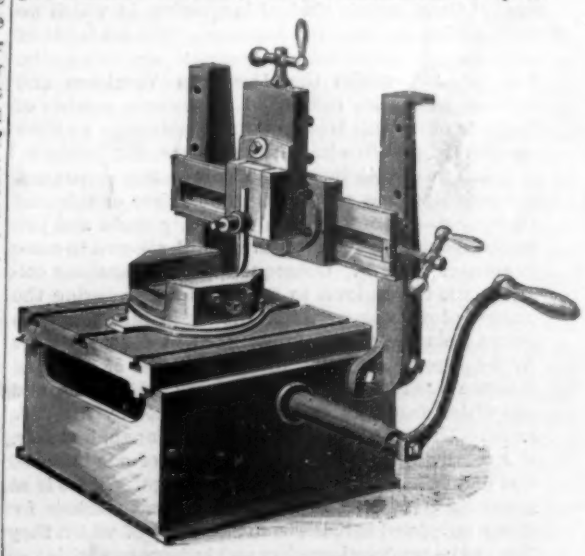
The expedition sent to Peru in 1889 under the direction of Mr. S. I. Bailey, having successfully completed the observations with the meridian photometer, returned to Cambridge with that instrument, which has been remounted here and will be used for a revision of the Harvard Photometry and for other photometric work. During the two years ending May 1, 1891, Mr. Bailey took 217 series of observations and made 98,756 photometric comparisons of about eight thousand southern stars. These include all the stars of the sixth magnitude and brighter south of —30° and all known catalogue stars in a series of zones 20′ wide at intervals of 5° in declination from —25° to —80°; also all known stars south of —80° and a miscellaneous list of variables, stars having peculiar spectra, etc. The reduction of these observations is nearly completed and their publication will be begun shortly. A large part of the work assigned to the Bache telescope has also been completed, and the instrument has been remounted at Arequipa, where its work will be continued.

An expedition under the direction of Professor William H. Pickering left Cambridge in December, 1890, and established a station about three miles northwest of Arequipa, where the thirteen-inch equatorial has been mounted. This station has an elevation of a little over 8,000 feet and has a nearly cloudless sky during a large part of the year. The air is remarkably steady, the images of the stars are small and round and the diffraction rings, seldom seen with large instruments, are clearly visible. Even with high powers the fluctuation of the images is very slight. In fact, at this station the limit to observation will probably be the size of the instrument instead of, as at other observatories, the condition of the air. Although the aperture of this instrument is only thirteen inches, it appears to be the largest refracting telescope in use in the southern hemisphere, while about thirty larger telescopes are mounted in the northern hemisphere. Since all of these instruments are north of +35°, nearly one quarter of the entire sky, and that containing many objects of the greatest interest, has never been studied by a refractor of the highest grade. For both these reasons an excellent opportunity is afforded to add to astronomical discovery by the erection of a telescope of a large size at this station. It is hoped that patrons of astronomy will consider the advantages of erecting a large telescope where it will be kept constantly at work, where the sky is clear a large part of the year, where the condition of the air is probably more favorable than at any other existing observatory, and where a large part of the sky could be examined for the first time under such satisfactory conditions.

Photographs have not yet been obtained with the thirteen-inch telescope, but it is hoped that its advantages for this kind of work will be as great as for visual observations. The expense of establishing this station was much greater than had been anticipated, since it was necessary to erect a stone dwelling house for the observers. A considerable advance from the future income of the fund has accordingly been required. Important aid was rendered to the expedition by many residents in Peru. Mr. MacCord, superintendent of the Mollendo Railway, should be especially mentioned for his hospitality to the observers, who resided with him while the new house was in process of erection. Without his aid the establishment of the station would have been extremely difficult. Two interesting expeditions have been made in Peru. One of them by the courtesy of Mr. Anderson, American Minister to Bolivia, was to Tiahuanuco and the sacred islands of the Incas on Lake Titicaca, and led to results of much archæological interest. The other was to the summit of El Misti, a nearly extinct volcano about nineteen thousand feet high.

AN IMPROVED HAND PLANER.

The accompanying illustration represents a compact, well made machine, designed to do exact work rapidly. It planes 12 inches long, 9 inches wide and 8 inches high, and has a universal planer chuck. A second size is made to plane 24 inches long, 12 inches wide and 12 high. This machine, with a general line of foot and power lathes and drill presses, is manufactured by H.



SHEPHARD'S NEW HAND PLANER.

L. Shephard, agent, No. 141 West Second Street, Cincinnati, Ohio.

Magnesium Flash Signals.

In 1889 some interesting experiments were made by Mr. W. P. Gerrish on distributing time accurately by flashes of magnesium powder. Signals were thus sent from a station on Blue Hill, Mass., twelve miles distant. They were readily visible, and the exact time to within a fraction of a second could be taken from them. These flashes were also seen from Princeton and Mount Wachusett, forty-four miles distant, and from numerous nearer points.

The Influenza Bacillus.

Authentic documents are now to hand which enable us to form an estimate of the accuracy and trustworthiness of the alleged discovery of a bacillus as the exciting cause of the influenza. It had already been surmised that the influenza poison resides in a minute bacillus, and there is now little doubt that this bacillus has at last been discovered, identified, separated, and cultivated by three different observers, all of whom have been working independently of one another. These bacteriologists are D. R. Pfeiffer, who has carried on his investigations at the Institute for Infectious Diseases at Berlin, Dr. Kitasato, and Dr. P. Canon, of the Municipal Moabit Hospital at Berlin. Their results are identical, and although all new discoveries are received by the scientific and medical world with considerable reserve till they have been abundantly and independently confirmed, it is earnestly hoped that the discovery of the cause may lead to that of the cure of the disease.

Dr. Pfeiffer has found the bacilli in the saliva and the bronchial discharges characteristic of influenza. They exist in the form of tiny rodlets, strung together sometimes in chains; they congregate in minute drops as clear as pure water. They can be obtained in pure cultures—that is, separated from all other forms of bacilli—in pure agar and sugar, or glycerine agar. In the saliva of influenza patients, the bacilli are found in immense quantities; they may penetrate from the pus cells into the tissue of the lung, and even pass as far as the surface of the pleura. This fact will explain the rapidity and fatality of lung complications in influenza. Dr. Kitasato, the learned Japanese assistant of Prof. Koch, has obtained identical results with those of Dr. Pfeiffer, and has cultivated the influenza bacillus in glycerine agar with marked success. Dr. Canon comes forward, however, at the same time with a still more striking discovery, for he has found the presence of the influenza bacillus in the blood of patients suffering from the disease, and, according to the opinion of Prof. Koch, the bacillus discovered by Dr. Pfeiffer in the saliva is the same as that discovered by Dr. Canon in the blood of influenza patients.

To the public these laboratory researches and discoveries are not merely matters of passing scientific interest. They are of deep and practical importance. The power to cure disease may not be vouchsafed to the physician even after the most earnest and arduous study; but to prevent disease is the crown of the medical art. The knowledge that a bacillus residing in the saliva causes influenza will not cure the epidemic; but the prompt and practical application of this knowledge by complete disinfection of all bronchial and nasal secretions and the isolation of influenza patients will stay the plague. It also indicates the reasonableness of what is known as the carbolic acid treatment of influenza, which has been practiced with considerable success, especially in the early stages.—*Daily Graphic.*

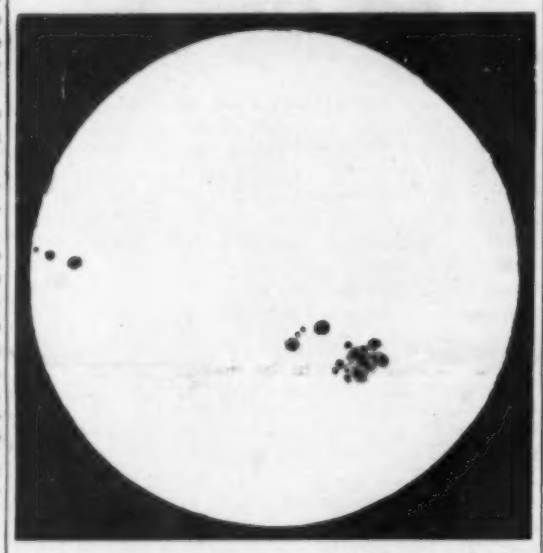
The Lacquer Tree of Japan.

A very interesting experiment has recently been recorded as having been conducted at Frankfort by Professor Rein, of Bonn, so well known for his splendidly illustrated work on Japanese arts. One of the principal of these arts is that of lacquering, in which no other nation can excel the Japanese. The art is one of great antiquity, and the old examples are very costly. The lacquer, unlike the European varnishes and polishes, which are compound substances, consists of the juice of a small tree known to botanists as *Rhus vernicifera*, and this juice is drawn from the trunks by making incisions in them, from which it flows into bamboo pots placed to receive it. The juices of this and all other species of *Rhus* are extremely acrid and poisonous, blistering the skin severely if allowed to come in contact with it. Consequently the Japanese collectors use thick gloves to cover the hands during the process of collecting. After the crude juice has been drawn from the tree, it is prepared in different ways by the Japanese experts, and the process of applying it to the wood or metal work is a very tedious one, and one which can only be properly effected by a native artist. The modern lacquer ware of Japan, however, is a totally different article from that of one hundred and fifty or even one hundred years ago. There is at present a great demand in the European markets for cheap lacquered articles, in consequence of which they have to be produced quickly and in large quantities, so that a very inferior article is produced, both in design and finish. Nevertheless, the process of lacquering has never been mastered by Europeans. It has been tried by practical varnish makers in this country, but always without success, and it is now thought by Professor Rein that if the trees could be established in Europe and the juice freshly drawn from the trunks, some of the difficulties of its manipulation might be overcome. Considering that several species of *Rhus* are hardy plants in our shrubberies, there is, perhaps, no reason why *Rhus vernicifera* should not be included among them. Indeed, this question seems set at rest by the fact that a number of healthy trees, some 30 ft. high, are now flourishing at Frankfort, the trees originally planted there having produced seed, from which other trees have been raised. The next question seemed to be whether the changed conditions of growth and climate would in any way affect the nature or composition of the juice, and to prove this some of the trees at Frankfort have been tapped and the juice sent to Japan to be experimented with by the native artists. Besides this, the native and European juices have been analyzed by German chemists, upon whose reports, coupled with those of the Japanese artists, it is expected the fate of lacquering as an industry in Europe will stand or fall. If the reports on the quality of the juice from Japan be favorable, it is proposed to plant the tree largely and bring over some expert workers from Japan to teach their peculiar art to European students.

There is, however, another use to which the Japanese lacquer tree might be put should it prove to take so kindly to European soil as to produce its fruits abundantly. These individual fruits are small—not much larger than a pea, but somewhat flattened—and are borne in bunches or clusters. They are covered with a thin, light brown shiny skin, under which, and immediately surrounding the seed, is a deposit of white wax, which forms, together with that of an allied species (*Rhus succedanea*), the product known as Japan wax, which is used by the Japanese for making candles, and is also exported in large quantities to China and to this country to some extent for a similar purpose, as well as for making wax matches.—*Industries.*

A GREAT SPOT ON THE SUN.

The largest sun spot that has made its appearance since 1883 became visible to the naked eye on February 10, the observer, of course, having the protection of a



smoked or deeply colored glass. The first careful observations of it at the Dudley Observatory, Albany, by Professor Lochner, indicated that the spot, or rather group of spots, covered a disturbed area of 140,000 miles in length, and from 90,000 to 100,000 miles in width. The principal spot had, according to Professor Lochner, two nuclei, each having a diameter of about 14,000 miles, while the penumbra around the principal spot had an extreme width of 65,000 miles.

The accompanying illustration represents the appearance of the disturbed area of the sun's surface according to an observation made at the SCIENTIFIC AMERICAN office at 10 o'clock on the morning of February 13. In looking with the naked eye, one sees only what appears to be a single spot, a telescope being required to make the separation into several spots or groups.

The Advance of Chemical Science in 1891.

Vast additions have been made to the science of chemistry during the year; new combinations of elements have been discovered, new properties of existing elements, new relations between physical and chemical action, and especially between the latter and those other forms of the all-pervading force which we call electricity. One of the latest announcements in this connection was that made at the Royal Society, in the beginning of December, that Prof. Dewar, of the Royal Institution, had "placed a quantity of liquid oxygen in the state of rapid ebullition in air (and therefore at a temperature of —181° Centigrade) between the poles of the historic Faraday magnet in a cup-shaped piece of rock salt," and to his surprise Professor Dewar saw the liquid oxygen, as soon as the electro-magnet was stimulated, "suddenly leap up to the poles and remain there permanently attracted until it evaporated." Dr. Gladstone has been as busy as usual investigating the molecular refraction and dispersion of various substances. Professor Crookes has been as busy as Dr. Gladstone, and his experiments on electrical evaporation have attracted special attention.

The burning question of "solutions" has been attracting much attention in the chemical world, giving rise to nearly as much difference of opinion, if not quite so much bitterness, as that of evolution in the biological world. It is strange to find a name intimately associated with English literature figuring as that of the author of an able address on the subject of solutions at last year's meeting of the Australian Association for the Advancement of Science. Professor Masson, of Edinburgh, has not deserted his old love, but his son in Australia, who has chosen the severer path of chemistry, proves, we are glad to say, that in the matter of careful and hard work he is a true son of his father. Professor Judd has been again dealing with his favorite subject of crystals, and, though he approaches it from the geological standpoint, it really belongs to the domain of chemistry. Professor Judd treats these products of nature as if they really lived and moved and had being, just indeed as if they were organic bodies. He talks of the "rejuvenescence" of crystals, and attributes to them other properties, which hitherto we have associated only with life. His researches are important as bearing on the very foundation of geological science. Professor Roberts-Austen's discovery of the most brilliant alloy known (75 per cent of gold with 25 per cent of aluminum) is of curious interest. More important are Mr. T. Andrews' researches on the passive state of iron and steel, which take us to the borderland between physics and chemistry. Two French chemists, MM. Cailletet and Collardeau, have been working at the critical point of water vapor. M. Moissan's researches on the element fluorine have yielded interesting results, owing to the intense chemical activity of this element. Another French chemist has been carrying on quantitative investigations as to the chemical action of light.

A research of interest, as showing the intimate relations between chemistry and biology, has attracted some attention during the year. It has been carried out by a young chemist, Mr. Cuthbert Day, who superintends the scientific work in Younger's brewery in Edinburgh. It deals with the sprouting of barley, and Mr. Day has by means of an ingeniously contrived apparatus endeavored to ascertain the precise influence of temperature on the process, with results that ought to be of both scientific and practical value. The chief point to be noticed is that, though there is a considerable falling off in the increase of the quantity of carbon dioxide produced when the temperature rises above 55° Fah., yet the effect in diminishing the increase in the weight of dry root is much more marked. To this almost random selection from the chemical work of the year must be added as an event of importance the jubilee of the Chemical Society on February 24, when, among others, Lord Salisbury gave an address full of suggestive skepticism, if not pessimism, in science.—*Chem. Tr. Jour.*

Government Trials of Magazine Firearms.

We learn from Capt. S. E. Blunt, Captain Ordnance Department, U. S. A., that the Secretary of War has lately given orders to the board on magazine arms "not to receive, unless authorized by the War Department, arms for trial after June 1, 1892, and for the board to then complete its labors and forward its report as soon as practicable."

All inventors or others who have corresponded with the board have been notified of these instructions and that the board's next session would be held at this armory, commencing on February 23.

Other sessions will be held as frequently and for as long periods as there may be guns on hand awaiting trial.

The trials are made at the National Armory grounds, Springfield, Mass.

It is understood the government is desirous of adopting the latest and best invention in magazine guns, and is looking for something superior, if possible, to the new European guns. Engravings and descriptions of those adopted in the armies of England, France, Germany, Austria, and Russia will be found in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 591, 597, 744, 783, 798.

Business Maxims.

The elder Baron Rothschild had the walls of his bank placarded with the following curious maxims:

Carefully examine every detail of your business.
Be prompt in everything.
Take time to consider, and then decide quickly.
Dare to go forward.
Bear troubles patiently.
Be brave in the struggle of life.
Maintain your integrity as a sacred thing.
Never tell business lies.
Make no useless acquaintances.
Never try to appear something more than you are.
Pay your debts promptly.
Learn how to risk your money at the right moment.
Shun strong liquor.
Employ your time well.
Do not reckon upon chance.
Be polite to everybody.
Never be discouraged.
Then work hard and you will be certain to succeed!

Correspondence.

Occupation for Old People.

To the Editor of the Scientific American:

In vol. 66. No. 4, page 55, you have a piece copied from *Chautauquan* on "Occupation for Old People."

I am not a writer nor much of a scholar, but I would like to read more written on the same subject by some one who has given the same more thought.

The above piece is most wholly written with a person in view who has been engaged in some occupation that was light—mostly brain work. I would like to have some one point out new work for men who have been machinists, masons, engineers, jewelers, blacksmiths, and similar trades.

I know a man who is past 60. He has been a good machinist and locomotive engineer; at one time a master mechanic (20 years ago) in railroad shops in Indiana. He is one of my daily callers. (I am a jeweler, 27 years old.)

He enjoys pretty good health for one of his age; but he is too old to work at his trade—is not strong enough, his eyes are not sharp enough. Some days he is happy, other days he is the "bluest" man I ever saw. He is always wishing he had something to do. He has plenty of money to keep him the rest of his life; but still he is discontented.

I think he would live longer if he had something to busy his hands with.

Of course the other tradesmen are about like the one I have told of: too old for the trade they have worked at all their life, and need something new to keep their hands and minds in better shape than will idleness, not so much for what they earn, but to keep them from seeing their age and looking for death.

I am young, have worked at watch repairing for nine years, my eyes are fine, and nerves good; but what am I going to do when I get too old for this work?

JOHN W. BLINN.

Antigo, Wis., Feb. 1, 1892.

Population of Alaska.

According to Census Bulletin 150, the population of Alaska is classified as follows:

Whites	4,303
Mixed (Russian and native)	1,819
Indians	23,274
Mongolians	2,287
All others	112
Total	31,795

The Indians are again divided as follows:

Eskimo	12,784
Thlinket	4,730
Athabaskan	3,441
Aleut	968
Tsimpsean	951
Hyda	391
Total	23,274

The enumeration was compiled under the direction of Mr. Ivan Petroff, special agent in charge of the Alaska Division of the Census Office.

Bound to Head it Off.

A young woman of Chicago has tabulated a list of symptoms of *la grippe* as follows:

Headache.
Pain in the back.
Can't taste anything.
Can't smell anything.
Can't eat anything.
Don't want to anyway.
That tired feeling.
Don't want to speak to any one.
Don't want any one to speak to me.
Don't care.
High fever.
Chills.
Craving for ardent spirits.
No craving.
Want to die.
Don't want to.

Whenever she feels the approach of any of the foregoing symptoms, she checks it off on her list and asks her mother to send for a doctor.—*Bulletin of Pharmacy.*

[The above faithfully describes the symptoms of the same complaint prevailing in our Eastern cities and towns.—ED.]

Illegal Telegram Contract.

The Court of Appeals of Montreal has rendered a decision in the case of the Northwestern Telegraph Company *vs.* Laurence, in which it declares illegal a contract printed on the blanks furnished by the telegraph company. The proof established the fact that the error was due to the negligence of the employes of the company. The appellant set up the plea that the dispatches were sent under a contract which declared that it (the appellant) would not be liable for damages resulting from errors unless the dispatch was repeated, and then only to the amount of fifty times the sum paid for the message. The Court of Appeals declared that this contract was contrary to public policy.

Liberal Education.

What should be the marks of a liberally educated man? I assume that, in common with strong characters who are not liberally educated, he has a vigorous will, by which the downward tendencies of his nature are resisted, and the upward aspirations of his soul are sustained and developed. I say nothing further in regard to his moral qualities, although they are closely related to those of the intellect. Five intellectual powers, as it seems to me, should be the property of every liberally educated man.

First, he must have the power of concentration; that is to say, he must be able to hold his mind, exclusively and persistently, to the subject which demands his attention. If this power is exercised in the domain of natural or physical science, it implies the most accurate observation of phenomena—the finest discrimination of the eye; in mathematics, it implies close analysis of all the conditions of the problem considered; in language, it implies the most attentive regard to the significance of terms and propositions.

The second power of an educated man is that of distribution. The knowledge that he acquires by close attention is of little value unless it is arranged and classified. His possessions must be placed in the groups where they belong, so that by association they may be at command whenever required. The man who knows a hundred thousand facts which have never been reduced to principles is like a millionaire whose fortune consists in tons of copper cents.

Third, the man of liberal education must have the power of retention; that is to say, he must tenaciously hold and remember that which he has learned. It is not enough that he can look up his acquisitions with effort; he must recollect them readily as occasion arises for their use.

Fourth, the liberally educated man must have the power of expression; that is to say, he must know how to state his thoughts so as to reach the minds of others; and this utterance should be equally good whether the pen or the voice be the instrument of communication.

Finally, the educated man must have the power of judging; that is to say, he must be able to make sharp discriminations between that which is true and that which is false, that which is good and that which is bad, that which is temporary and that which is perpetual, that which is essential and that which is accidental. In other words, he must have the power to lay the emphasis where it belongs, and this will soon bring with it the allied moral power of decision, of making a choice between the one side and the other. All this may be summed up in the one word wisdom.

But again, it is not enough to have these powers. The liberally educated man must also have certain possessions, which will be like the capital of a merchant, useful to him for the promotion of his own enjoyment and for the increase of his usefulness.

First among the branches of knowledge which he should possess, I would name the knowledge of his own physical nature, especially of his thinking apparatus, of the brain and the nervous system, by which his intellectual life is carried forward. This implies that he should also have a knowledge of the lasting effects of bodily habits upon mental vigor. He ought to know how best to lead an intellectual life, how best to discipline his body by the proper laws of sleep, diet, and exercise, and by the right employment of those supports which may be helps or may be curses.

Second, he should have a knowledge of his own tongue, of its history and development, of its laws, its idioms, its capabilities, its use. If he knows all the languages of Babel and has not the command of his own, he is most imperfectly educated.

Third, in these days it is important that he should also have a knowledge of other modern tongues. More than two of these would be advantageous, but a liberal education absolutely requires that every English-speaking person should have a knowledge of French and German also.

Fourth, the liberally educated man should also be acquainted with the principles and methods of scientific inquiry.

Fifth, a liberally educated man should know something of the great literatures of the world. Whether he acquires that knowledge by the study of the original tongues or through translations, he should become acquainted with the masterpieces of poetry, eloquence, history, the drama. Isaiah and Paul, Homer and the Greek tragedians, Dante and Petrarch, Shakespeare, Cervantes, Goethe, should be his familiar friends; not because he has "read about them" in the biographical dictionary or in the annals of literary history, but because in hours of repose he has read their pages, reflected upon their thoughts, and given himself up to their inspiring influence.

Sixth, the liberally educated man must have a knowledge of the experiences and opinions of mankind. He must know the intellectual history of his race, the slow and wearisome steps by which civilization has advanced from the dawn of our institutions and ideas down to the discussions of our own day. It is obvious that a "liberal" education is not to be limited by the period devoted to a college course or a course in technology. It begins in the nursery, it goes on in the domestic circle, it continues through school, college and university, it only ends with life.—*Prof. Daniel C. Gilman, in the Educational Review for February.*

The Transport of Ammonia.

Ammonia has been carried in considerable quantities on the upper decks of steamers, but in many vessels the bottles, carboys, or tins are stowed in the between decks. In fact, they are sometimes stowed in vacant cabins of cargo vessels. The recent explosion of one of these receptacles has awakened attention to the placing of such substances dangerously near heat. The master of the vessel on whose ship the explosion happened unscrewed the tops of all those undamaged, and thus allowed the gas to blow off. Restrictions on carriage of dangerous goods were imposed under the Merchant Shipping Act, 1873, section 23 of which provides that if any person sends or attempts to send by, or, not being the master or owner of the vessel, carries or attempts to carry, in any vessel, British or foreign, any dangerous goods, such as aquafortis, vitriol, naphtha, gunpowder, lucifer matches, nitroglycerine, petroleum, or any other goods of a dangerous nature, without distinctly marking their nature on the outside of the packages containing the same, and also giving written notice of the nature of such goods and the name and address of the sender, he shall be liable to a penalty not exceeding £100; but if the person sending the goods on board is merely an agent and ignorant of the contents, the penalty is not to exceed £10. False description makes the sender liable to a penalty of £500. The master or owner of a ship may refuse to take on board a vessel any suspicious package, and may require it to be opened to ascertain its contents. Clause 26 in the act has always been looked upon as a mistake in legislation. The master of a ship is empowered to throw overboard goods of a dangerous nature which have been sent without being marked or notified of their true character, and neither the master nor the owner of the vessel shall be subject to any liability for such casting into the sea, civil or criminal, in any court. There is no reason for denouncing the carriage of ammonia by sea, but it is of the greatest importance that each special compound should be accurately defined, and that it ought not to be exposed to heat. If everything that expanded on submission to heat were interdicted, the shipping trade would be sadly hampered. For example—yeast is shipped for conveyance, and is usually carried on deck. In hot weather the casks have been broken and hoops burst from exposure to the sun, although no material damage is done. We could name other breakages, but enough has been urged to bring home the necessity for understanding what to carry and where to stow it.—*Chem. Tr. Jour.*

Pathological Anatomy of Insanity.

In the *Journal de Medecine de Paris*, March 1, 1891, Dr. Luys states that in examinations of brains of patients suffering many years from excitement, there is hypertrophy of certain special regions of the paracentral lobules. These lobules are the point of confluence of cortical psycho-motor convolutions and one of the regions where accumulate specially psycho-motor innervations. Hypertrophy would, therefore, indicate a focus of continued excitation, absorbing undue vitality, and leaving other regions to undergo more or less marked atrophy. This hypertrophy is usually symmetrical in both hemispheres. In the brain of a woman who had a visceral delusion, that was almost her sole idea, to the effect that a tape worm found a lodgment within the internal organs and came and went at pleasure, there was unilateral hypertrophy of the paracentral lobules, those in one hemisphere remaining perfectly normal. The patient was perfectly lucid and rational on all subjects except this one delusion, though it was difficult to induce her to speak of any other. Anatomically, Dr. Luys explains the coexistence of clearness of mind and a delusion. She was insane in one hemisphere of the brain and sane with the other. For such cases, the colloquial term "unbalanced" would seem to be literally true.—*Medical Record.*

Manganine, a New Alloy.

Manganine is the name of a new alloy, consisting of copper, nickel, and manganese, which has been brought on the market, says *Iron*, by the German firm Abler, Haas & Angerstein, as a material of great resisting power. The specific resistance of manganine is given as 42 microhm centimeters, that is, higher than that of nickeline, which has hitherto passed as the best resisting metal. Another advantage of manganine is its behavior under variations of heat, the resistance, it is claimed, being affected only in a minute degree by high temperatures. It is therefore adapted for the manufacture of measuring instruments and electrical apparatus in general, which are required to vary their resistance as little as possible under different degrees of heat. A further interesting fact is that, while other metals increase their resistance by the raising of the temperature, that of manganine is diminished.

THE ODD FELLOWS' TEMPLE, CHICAGO.

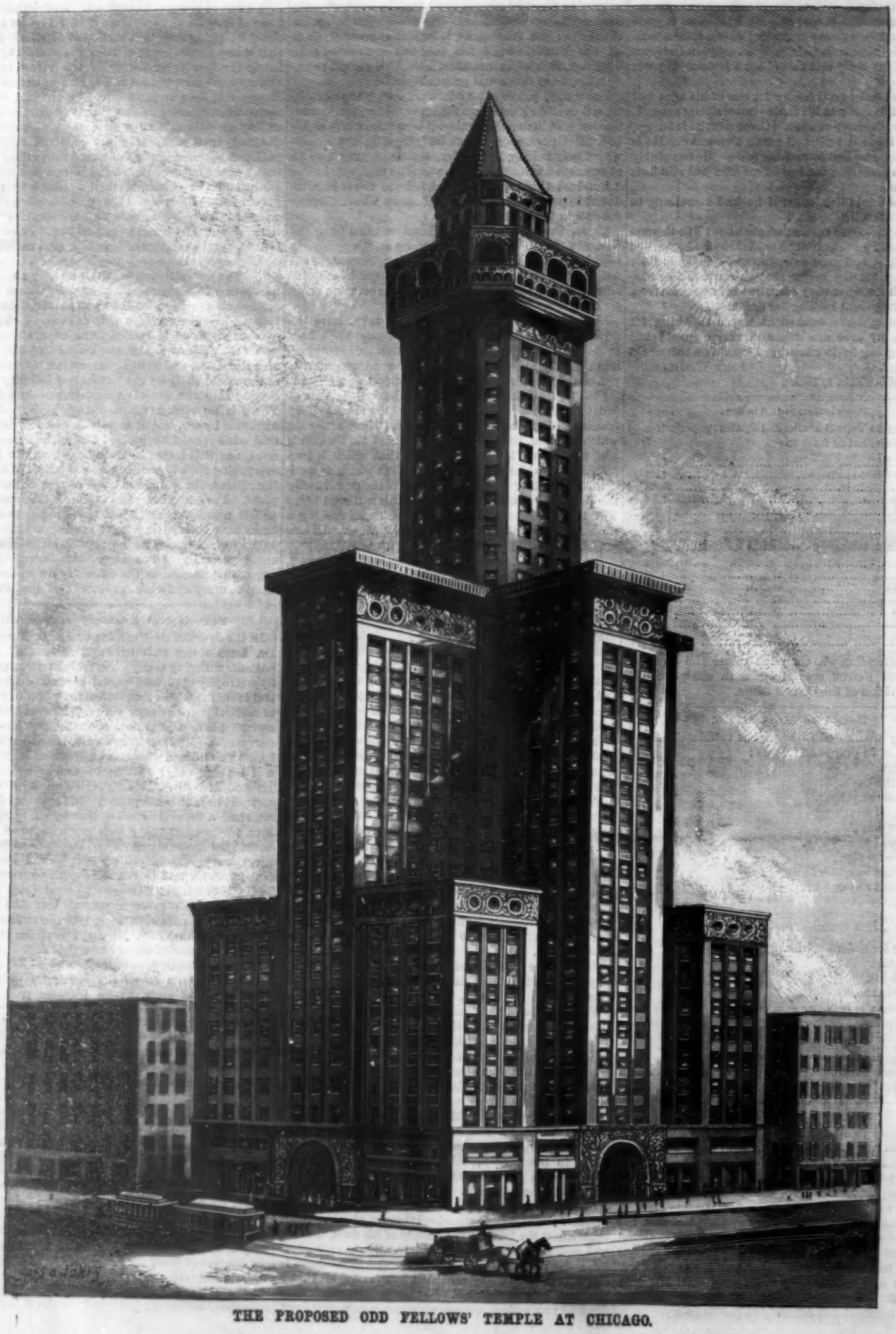
The new temple soon to be built in Chicago by the Odd Fellows of the State of Illinois is to be one of the most imposing structures of its kind in the United States, and the tallest building in the world. Rising to a height of 556 feet, the tower will be visible at a distance of sixty miles, and every available foot of space will be utilized. Upon the ground floor the area covered will be 43,000 square feet, and the total area inclosed by the various floors, exclusive of walls, partitions, corridors, etc., will be something over 350,000 square feet.

Twenty stories of the building will be included in the main structure, while the tower is to be fourteen stories high, and, like most of the rest of the building, will be devoted to offices, eighteen elevators and four stairways giving access to the topmost floor. Five floors of the building are to be devoted to lodge rooms and public halls, among the latter being a drill hall, with an area of 8,000 square feet.—*The Graphic.*

A Suggestion for Inventors.

A correspondent, who lives in the distant colony of Tasmania, Australia, indicates his troubles in land clearing, and calls for inventions as follows:

Could you publish in your SCIENTIFIC AMERICAN the best devices for felling trees and cutting them up when down, say from two to four feet in diameter? We have an immense lot of timber on the land in Tasmania. When a selecter takes up a block of land, the device we have is to fell the trees with an ax, and, when down, two men cut them up into say 15 ft. lengths with a cross-cut saw, roll them together in heaps and burn them. The timber is of no value, there is so much of it. There are as many as 400 and 500 trees per acre, averaging about 3 ft. in diameter and about 200 ft. in height. They cost the selecter about five dollars per tree to get rid of them; so you will see that it is not all sunshine with the selecter in Tasmania. What we want is something to reduce the cost per tree; or, in other words, some device other than felling them with the ax, as it is so laborious.



THE PROPOSED ODD FELLOWS' TEMPLE AT CHICAGO.

Some Results of New Inventions.

T. F. O'Rourke, President of the Hat Finishers' Association, asserts in a late address that "some districts have suffered from the introduction of improved machinery." He adds that "it is not desirable to oppose machinery, . . . yet many shops are putting in machines which, with the assistance of the boy system prevailing in Philadelphia, will work great injury to us."

The readjustment of laborers consequent on the perpetual invention of improved machines is a source of perpetual disturbance everywhere, and always has been in civilized societies. So are changes of fashion—as when shoe buckles went out, a large body of buckle makers were brought to destitution. Both, however, are only a part of the general social movement, which is incessant and endless. No fixed status is possible in a universe of evolution. The only way the individual can keep his place is by evoluting also and enlarging his range of industry. The workman must be flexible and quick to learn new things. He must cease to think of stopping the flood of novelties and learn to swim in it. Business men of all kinds are troubled by the same instability of affairs. He who will not change is submerged, he who changes with the times gains by the time's changes. It is hard and requires activity, but there is no other way.

New machines cannot be prevented; nor should they be, since they enrich the world and have made the workingman's progress to be what it is already. He never had a fraction of his present comfort till steam machinery began to do his work for him. House, clothing, good food, education, clubs, newspapers, all his advances are the result of modern machinery. It is the Atlas which carries the world's welfare on its shoulders; every bit of work it does is so much lifted from the strain and drudgery of the laborer as well as of the rest of us. By cheapening production it increases consumption, which calls for more labor, which new labor is easier than before the machine went to work. Think of the toil of the old-fashioned farmer in harvest, compared with that of him who now sits on his reaper and binder in comparative ease all day! The workman who learns to understand new machinery rapidly and helps to work it is the man of his time, and this should be the model and ambition of all. The times reward the nimble and quick-witted—which all should make haste to become. And the duty to do so is laid upon them by nature, not by society. Society cannot prevent men from thinking out improvements which nature puts into their heads. And therefore the workman must keep himself right with nature, as indeed he is learning to do.—*The Social Economist.*

A Versatile Gunboat.

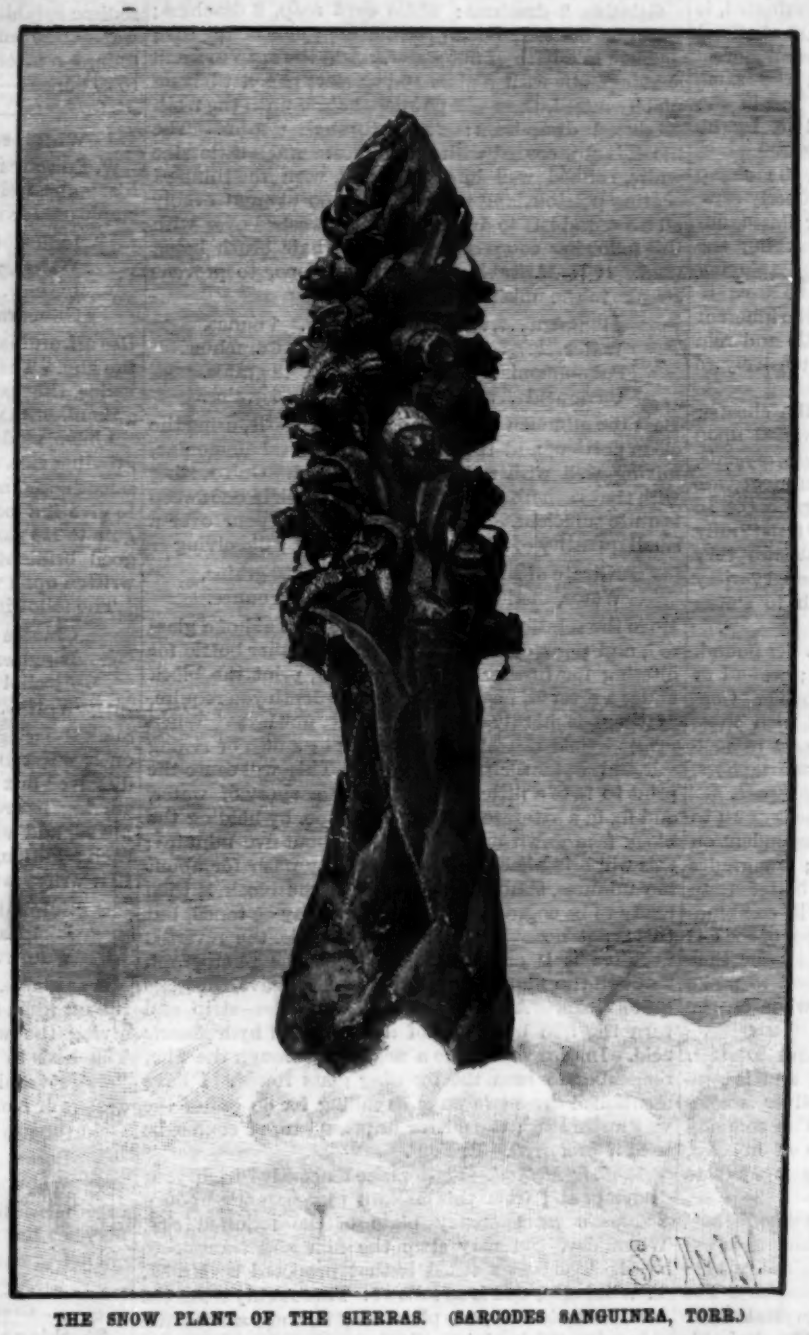
A new gunboat, the Svensksund, has been added to the Swedish navy. It has been built by the Kockum Engineering Works, of Malmo. Her dimensions are: Length, 120 feet; breadth, 21 feet; draught, 9 feet. The armament consists of four Nordenfelt guns and torpedoes. The vessel will, however, be more useful in time of peace than in war, as, first, she is a powerful ice breaker, fitted with water tanks for sinking to the desired depth; secondly, she is furnished with heavy gear for towing or hauling off stranded vessels; thirdly, she is equipped as a fire steamer, having ten large suction hoses and a centrifugal pump capable of delivering 22,000 cubic feet of water per hour; fourthly, she is fitted with condensers furnishing 800 gallons of water per hour; and fifthly, she is equipped as a torpedo repairing vessel. The engines with which this combined ice breaker, tugboat, fire engine, water supplier, torpedo repairing shop, and man-of-war is equipped are of 150 indicated horse power, giving the vessel a speed of 12¾ knots.

The Highest Electric Central Station.

Pontresina, a locality of the Grisons Canton, Rhætia, situated at an altitude of 6,000 feet above the level of the sea, in a vale running parallel with the Inn Valley, on the road leading to the celebrated Bernina Mountain and Pass, is understood to claim the possession of the highest electric central station. The motive power for generating the current is furnished by a torrential stream of the same name, the cascade of which is of immense advantage to the district. The inhabitants of this sequestered nook, who exhibit greater evidence of business aptitude than one might expect from simple mountaineers, have formed themselves into a—not exactly a limited company, but into a kind of Lancashire co-operative society, to the end that each lowly shepherd's hut is supplied with electric light and power almost for the mere asking. The water falls from a height of 430 feet, producing a cascade, the utilization of which to the extent of 300 liters only yields a source of energy giving theoretically, without loss, 530 horse power.

THE SNOW PLANT OF THE SIERRAS.

We present herewith, from a photograph taken by Mr. Taber, of San Francisco, a figure of the California snow plant (*Sarcodes sanguinea*, Torr.), so called because it thrusts its stem up through the snow to a height of nine or ten inches, and flowers when no other vegetation is to be seen. This curious plant, which belongs to the order Ericaceæ, is allied to the *pine drops* (*Pterospora*), but has much larger flowers, an elongated style and wingless seeds. There is but one species (the one here figured), which is an erect herbaceous parasite, with succulent, scale-like leaves, and a long raceme of pendulous flowers. The whole plant is of a blood-red color.



THE SNOW PLANT OF THE SIERRAS. (SARCODES SANGUINEA, TORR.)

A Simple Process for Coloring Photos.

The following is a process by which colored photographs can be made without any knowledge of drawing or painting.

Take any unmounted photographic print which it is desired to color, and place it on a pane of glass, the face toward the glass. In this way the image will be seen through the back of the paper.

With an ordinary pencil mark on the back of the print a rough tracing of the outlines of the photograph, marking the places where the colors must afterward be applied. When this tracing has been made, remove the photograph, lay it on blotting paper, and apply the colors to the back of the print. The colors should be spread on in flat tints, it not being necessary to use demi-tints. For example, a flesh tint is put on the face, and black or brown on the hair; if the picture is a landscape, the trees are colored dark green, the sky part blue. It is important to use strong colors, which will show through the paper better. After this operation is finished, and when the colors are dry, the photograph is rendered transparent, as follows:

First prepare the following solution:

Essence of petroleum or benzine	10 parts.
White vaseline	1 "

The vaseline is dissolved in the liquid, and then the mixture is ready for use. Then the photograph, which has been colored previously, is placed on some sheets of white paper, and the back of the picture is saturated first, pouring the solution on it, and rubbing with the finger to cause the mixture to penetrate, first the color and then the paper. The print is then turned face upward, and this side is saturated in the same way.

After this operation the paper becomes oily and transparent, and the color begins to show through.

It is left to soak thus for an hour or two, then both faces are rubbed with linen until no oily spots can be seen, when the proof is placed on white paper.

The operation is then completed, and the proof has only to be pasted on cardboard, the same as other photographs. But, as the paper is still saturated with vaseline, water paste will not answer, and some kind of varnish will have to be used.

This process of painting, which can be used by any one, gives very beautiful effects.

Colors which are thus applied to the back of a photograph give it a tone of admirable freshness, and the vaseline mixture brings the image out. Besides, as the colors have the thickness of the paper to pass through, they are greatly softened, and thus approach nature. The variations of the tints will be seen, by transparency, when looking at the picture.

As to the colors, any that are at hand can be used, whether water colors or oil colors. The essential point is to choose the most strong colors, rose, green, etc., and to put on only a very thin layer, as otherwise the vaseline cannot pass through it. If oil colors are at hand they will be better, and the result obtained will be much prettier, for they are more striking, and the vaseline passes through them better. Pastels or colored crayons can be used, but oil colors are greatly to be preferred to any others.

If it is desired to save, and not to color, the photograph, its outline can be traced off on ordinary white paper, and the colors applied to the white paper as before described. Then it is only necessary to paste it on the mount behind the photograph, care being taken to render the latter transparent, and the two must be so placed that their outlines will agree. The effect obtained is the same, and gives very pretty results, not showing in the least how they are done.

Fractional Currency Scrip.

A movement in favor of the issue of fractional currency is in progress. Business men who conduct a large business by mail are much annoyed by the want of some mailable form of currency. Silver coins are too heavy and bulky for transmission by mail, and are far from safe, as any one who handles the letter can ascertain their presence. Postage stamps have come into extensive use for the transmission of small amounts, and this has become, in many cases, a positive annoyance, owing to their accumulation on the hands of merchants. They are also bought at post offices which, under the law, obtain no credit for selling them. We believe that, from these points of view alone, the reintroduction of "fractional currency" would be an excellent enactment on the part of the government.

A Large Glove Industry.

At Grenoble, France, it is said that 1,200,000 dozen pairs of gloves are manufactured annually. This represents a value of $7,000,000 to $7,200,000, and gives employment to 25,000 workpeople of both sexes. There are 4,000 men and 21,000 women residing in a rayon of 38 miles around Grenoble who live by this work. Glove making, then, is interesting from a social point of view, as it is one of the few callings open to female labor in which they can earn respectable wages without abandoning husbands, homes, and little ones. The writer adds that out of the $7,200,000 worth of gloves made in that region at least $3,000,000 are distributed in wages among an almost infinite number of families. *New York Recorder*

Morocco Manufacturing.

Though so much has been learned in respect of the methods of manufacturing glazed kid, there seems to be room for the acquisition of more knowledge. An acquaintance with the chemistry of various drugs used in the process is essential. Chemical purity is an absoulute necessity in the production of high quality stock.

In regard to the strength of the tanning chemicals primarily used in the chrome tannage, there is this to be said: Muriatic acid should have an inherent strength of 21 to 22°; yet quantities of a debilitated variety, registering only 16 to 17° test, are disposed of. This ingredient is used as well with the combination as with the chrome tannage, but in the latter performs the major part of chemical action. In connection with the chrome and hypo. it creates a gas, producing a glutinous substance in the chrome tannage. Oil of vitriol standard is 66°; below that it is generally vended as sulphuric acid and so billed. This quality stands from 60 to 64° test. Water, not thoroughly eliminated, is the cause of the depreciation in quality. Oil of vitriol is used for plumping heavy leather as well as all morocco tannages. Muriatic acid will perform the same function, but it requires longer time to attain the result. Oil of vitriol is worth, ex store, 1½c. by the carboy.

White sugar of lead is now little used; the cheap variety rules at 20c. per pound, being improperly crystallized. Damp weather prevailing during its manufacture is one cause of inferiority, diminishing the quality and marring its appearance. In employing the lower qualities, one-third more must be used to accomplish the same result, and even then the inherent strength is lacking. Makers of bridle, saddle and rein leather use white sugar of lead very extensively to bleach or whiten their product.

Borax crystals in barrels sell at 13c., the cheaper grades vending as low as 8½ to 10c., conditional upon the proper removal of the impurities. These crystals, while generally used only in the chrome tannage, are occasionally worked in the combination process. In powdered condition its dissolution in water is naturally almost instantaneous. And as the crystals are very solid, the saving in time by using the powdered variety is important. Borax crystals are used both to soften water and cleanse the skins.

Imported Chinese nutgalls are worth 21c. per pound. In casks they are sold at from 20 to 23c.; ground or finely powdered makes the best black coloring. Copperas and sulphate of copper, combined with these nutgalls, produce wonderful results by greatly intensifying the brilliancy of the jet black. Some tanners, and also dyers, use ammonia for the same purpose.

Hyposulphite of soda in cheaper grades sells at 2¾ to 3c.; fine grades bring 3½c. The value is dependent on the amount of soluble sulphur contained; low grades having only 25 per cent are really no better than Glauber salts. Hypo. is used somewhat in combination, but largely in chrome tannage. Hypo. of soda is used to strengthen the fabric and at the same time soften it. Hypo. is also popularly supposed to make the finished leather impervious to water when on the foot.

Glycerine, chemically pure, should stand 30° test. "B," or Baume, is temperatured at 60°, and is pure white and of good body. Nitrate of silver is commonly used in an analysis of quality. The common quality sells simply as glycerine, but is off in color, displaying a yellowish cast. Glycerine is used to render the leather pliable.

Sulphate of iron or green dry copperas is the best to use. It sells at one cent per pound, and in lower grades at one-half off ruling price, and contains 35 to 40 per cent of water, quite an expensive economy. The best quality is of brighter hue and the crystals more perfectly formed. This sulphate creates the desirable intense black color, and is used in all tannages.

Sulphate of copper, or blue vitriol, in its pure state, contains 25 per cent of metallic copper. The common appears whiter and will be permeated with iron and other impurities in proportions of from 40 to 60 per cent. This sulphate is used for the same purpose and as an addition to sulphate of iron. Ex store this sells at $4.30 for the best and $3.75 for lower qualities.

Logwood comes in five grades, and of course the most expensive gives the best results. It is excellent for blacking the skin and is particularly efficacious when used with nutgalls, as is also sulphate of copper. Logwood is popular with all tannages.

Campeachy logwood, if coarse cut, takes longer to boil, but is purer and the sap is more thoroughly extracted. Sappy wood creates a resin on the surface of the skin, which is difficult to eradicate. Best quality is on sale at 2c. per pound.

Bichromate of potash is powerful in its effect, and alone would burn and destroy the fiber of leather and rot it; fine hyposulphite of soda neutralizes its strength and keeps the whole cool. It is from the bichromate of potash that the chrome tannage derives its name. It is in the form of large four-sided prisms, orange red in hue, devoid of odor, and to the tongue imparts a bitter, disagreeable taste. The bichromate, while soluble in 10 parts of water, is insoluble in alcohol. With alum there are the ground and lump varieties. Common alum contains only 17 per cent of alumina. Pure sulphate of alum contains 58 per cent of pure alumina and is devoid of both acid and iron, which is extraneous; the cheaper grades are possessed of both. Too much acid is likely to destroy the color and create a harshness in texture.

Sig: this ingredient, which is really human urine, has recently been largely substituted by a chemical compound, which has the same effect and dispenses with the unpleasant handling of the original substance. Sig is used to assist the mordant or bottom, and permit the color to more readily adhere thereto. Sulphate of alumina is another ingredient used in both the combination and chrome tannages, many manufacturers believing that its incorporation results in an improvement to the leather.—*Shoe and Leather Reporter.*

Photographing on Wood, using Dry Plates.

Gelatine, 2 drachms; white curd soap, 2 drachms; water, 16 ounces. Soak gelatine for some hours, then dissolve in a bath of hot water. Add the soap in small shavings, stir with a glass rod or slate pencil till completely mixed, then add powdered alum until the froth produced disappears; strain through muslin. The block is now coated with this mixture and a little zinc white, rubbed well into the wood, with the thinnest coating possible, and finished off smoothly and evenly all over, and left to dry. It is then brushed over with the following composition, a camel hair brush being used. It is advisable to use a wide one, to prevent streaks in the finished block:

Albumen	1 ounce.
Water	6 drachms.
Sal ammoniac	18 grains.
Citric acid	5 grains.

Beat the albumen to froth and allow to settle, using the clean portion, add the water, then the sal ammoniac, mixing well with rod; finally the acid. One coating with the brush from end to end of the block in one sweep is quite sufficient. When the block is dry pour over a small quantity of silver solution, made by dissolving

Nitrate of silver	50 grains.
Water, distilled	1 ounce.

Move the solution over the surface by the aid of a glass rod, and pour off the surplus into another bottle for filtering for further use. When dry, print the block under a reversed negative to just the depth you require, as there is hardly any loss in the finishing. When printed, hold the block face down in a dish of strong salt and water for three minutes. This will cause the print to fade a little. Wash under a spray of water, and fix in a saturated solution of hypo. by holding the block face down on the bath for about five minutes; this will bring back all detail; finally wash for about ten minutes, stand on end to dry; the block is then ready to be engraved. The picture may be toned, but this is not necessary. In order to make the reversed negative it is only needful to take the photograph through the film, care being taken to have the glass quite clean. Another method would be—strip and turn the film by means of a solution of hydrofluoric acid. In case you make a negative through the film, remember to turn the focusing glass round. I have mentioned these two ways as calling for no out of the way apparatus; the mirror or prism can, of course, be used if preferred.—R. K. F.

Another Method.—First make a negative from your drawing, and from this make a transparency upon a Thomas's transparency plate of the required size. When dry, you may strip the film and transfer to wood. The best method is that proposed by Mr. W. T. Wilkinson, and is as follows: Thoroughly clean the *back and edges* of your plate, level it, and coat the film side with thick, plain collodion, allow to set for one hour, place in cold water until the film no longer appears greasy when lifted, then immerse (in *an ebonite dish*) in dilute *hydrofluoric* acid (1 of acid to 20 of water), and allow to remain until the corners of the film can be lifted away from the glass. Do not hurry it, wash under tap for a few seconds, put the plate into clean water (film up), and detach from plate, leaving film floating upon water. Coat your wood face with gelatine solution (gelatine, one ounce; water, twenty ounces; chrome alum, five grains; and filtered), let it dry and slide it under film, adjust in position and lift from water, cover the film with tracing cloth and squeegee down. When dry it is ready for use. It will dry quickly after immersion in methylated spirit.

Another.—For photographing on wood, Wilkinson recommends the following: Make a solution of chloride of ammonium 10 grains in 1 ounce of water, to this add the white of one egg and stir well, then add sufficient zinc white to make a thickish paste. Take the wood block and free it from grease by rubbing with a soft rag dipped in spirits of wine, and apply the paste in as thin a layer as possible, rubbing with the ball of the hand, and stand it on end to dry. Dip the prepared surface in a 60 grain nitrate of silver solution for two minutes, and blot off lightly with filter paper. It is as well to coat the edges of the block with tallow, to prevent the silver solution and fixing solution from touching the wood. When dry, expose under a reversed negative, and just dip the exposed surface in a weak hypo. solution to fix the image, blot off, and rapidly remove any hypo. by blowing a stream of water across the surface; blot off, rinse in methylated spirit and stand on end to dry. The best plates to use are the special photo-mechanical plates supplied by Mawson & Swan or J. D. England. These are slow plates, giving great density with clearness in the shadows and clear lines. For the former use the following developer, as recommended by the makers of the plate:

A.—Pyrogallic acid	60 grains.
Meta-bisulphide of potash	60 "
Bromide of ammonium	60 "
Water	20 ounces.
B.—Ammonia (liquid)	2½ drachms.
Water	20 ounces.

Equal parts of each.

For England's plates use: Hydroquinone, 150 grains; sodium sulphite, 1 ounce; bromide of potash, 20 grains; water to 20 ounces. With equal parts of carbonate of soda, 2 ounces; carbonate of potash, 2 ounces; water to 20 ounces.—*Photography.*

White Ink for Marking Lantern Slides.

W. Edison can use ordinary Chinese white for marking his lantern slides, or the following solution can be employed for writing on the film:

Iodide of potassium	10 parts.
Water	30 "
Iodine	1 "
Gum arabic	1 "

Use an ordinary pen, writing on the dark portions of the film. The solution converts the silver into silver iodide, thus producing white letters on a black or dark ground.—SIGMA DELTA.

I have made a white ink that answers very well, by grinding zinc white (oxide of zinc) with water till quite smooth, and adding a little clean gum arabic, enough to give it a body and bind it. Try 4 parts of picked gum to 120 parts of water, adding enough zinc to give good brilliant white. I send a bit of black paper written upon with ink made as described.—R. K. F.

The following is an excellent formula:

Chinese white	1 ounce.
Isinglass	2 drachms.
Alcohol	1 "
Water	q. s.

Soak the isinglass in a little water until soft, then heat on a water bath until dissolved. When thoroughly dissolved mix into a paste with the Chinese white, well stirring it around with a piece of stick. When well mixed, add water in small quantities, well stirring at each addition, and trying it with a clean steel pen until it writes satisfactorily, then add the alcohol; or use:

Sulphate of baryta	1 ounce.
Isinglass	2 drachms.
Water	q. s.

Mix as above. The worst of all white inks is that they rub off when touched. This can only be prevented by giving the writing a protective coating of varnish. The best to use for the purpose is that known as "water varnish;" it can be bought at most photo. dealers or made by boiling:

Shellac	16 ounces.
Borax	3 "
Water	3 pints.

together until dissolved. When thoroughly dissolved may be thinned with water if too thick.—WIDE ANGLE.—*Photography.*

Great Power and Light Weight.

Speaking at the annual meeting of the Aeronautical Society, a few days ago, Mr. Hiram Maxim vouchsafed some particulars with regard to the motor which he has designed to actuate his flying machine, that afford some clew to the care and thought he has devoted to the problem, and which indicate that he has in one direction at least made a great advance on the efforts of previous workers in this field. The steam engine which he is employing is so highly developed and carefully designed that he assured his audience he could obtain a brake horse power for each 10 pounds of weight of engine, boiler, and condenser. This, as Sir James Douglas remarked, is a remarkable attainment, and means nothing more nor less than the equivalent to the strength of a full-grown man being exerted by a piece of mechanism weighing but 1½ pounds at most.

IN a memoir to the Academie des Sciences, M. Blondlot has given the results of his researches on the velocity of propagation of electrical waves. Using Hertz's method, he has obtained waves varying from 8·04 meters in length to 35·36 meters; twelve different wave lengths in all being experimented with. The results are very concordant, giving a mean velocity of propagation of 297,600 kilometers per second, which is practically the same as the velocity of light, and the ratio of the electro-magnetic and electro-static units.

RECENTLY PATENTED INVENTIONS.

Engineering.

ROTARY ENGINE.—George H. Graham, Ridgeland, Ill. This engine is designed to be simple and durable in construction while being very effective in operation and utilizing the motive power to the fullest advantage. The invention provides principally a spring-pressed valve within a casing in which a friction roller is journaled and from which a valve stem extends, a lever being pivoted on the stem and springs pressing against the lever, there being a lubricant-receiving space in the rear of the roller. Three of these valves, arranged radially and sliding in suitable bearings in the rim of the cylinder, are located on the peripheral surface of the piston, between the vanishing points of curved flanges arranged near the ends of a radially extending head of the piston, close to the inner sides of the cylinder.

BOILER FEEDER. — Heinrich Rauser, Charles Wieber, and Alexis Sokoloff, Moscow, Russia. In combination with the boiler and feed pump is an ejector connected with the boiler and in communication with the valve chamber of the pump, a float arranged in the boiler controlling a valve connecting the ejector with the boiler. The invention also comprises other novel features, the improved boiler feeder being completely automatic in operation, preventing a dangerous filling of the boiler and also giving a signal in case the water should sink to a dangerous level, while the construction is of a simple and durable character.

AERIAL TRAMWAY. — Emilio Prunetti and Giambattista Avignone, Sierra City, Cal. This invention relates to suspension tramways operated by gravity, to transport loads in receptacles from an elevated to a lower plane in a speedy and safe manner, as in the conveying of ore from mountain deposits to reducing plants. Combined with an endless cable are two upright frames on which are mounted two horizontal grooved pulleys, with a brake mechanism, while in connection therewith are two wire rope tramways, and windlass supports therefor, cars being mounted on the tramways and oppositely connected to the endless cable.

DREDGE.—John H. Kuoni, Marysville, Kansas. This invention provides an improvement in what are known as "clam shell dredges," simplifying their construction and making them more easy to operate, the dredge being more particularly adapted for cleaning wells and similar purposes. It consists of a bottomless receptacle to the opposite sides of which are hinged shovels, while to opposite ends is secured an arched bail having a central loop or aperture through which passes a rod, chains connecting the shovels and the rod, and a locking bar pivoted to one of the shovels being connected with the rod by intermediate devices.

GRAVEL SCREENING MACHINE. — Franklin T. Gilbert, Walla Walla, Washington. A continuous treatment of gravel is provided for by this machine, whereby a number of separations of the coarser from the finer grades will take place. The machine has a series of rotary screens of different mesh, the coarsest receiving water and gravel direct from the flume or hopper, which serves to throw aside the coarsest gravel but allows to pass the water and finer grade of gravel, which is led to the next finer screen, where the same operation is repeated and so on with the remaining screens, the waste water being utilized to drive the screen-operating shafts. According to another patent granted the same inventor, the machine comprises a main frame formed with a series of bins, over which receiving troughs are mounted step by step, each trough having a closed receiving and an open discharge end, the discharge end of one trough being over the receiving end of the next succeeding one, while a series of screens of different mesh is interposed between the meeting ends of the several troughs, to successively separate the larger particles from the water and deflect them to their respective receiving bins. In operation the screens are constantly shaken or agitated by a reciprocating bar.

Railway Appliances.

AIR BRAKE. — Ray G. Coates, Punta Arenas, Costa Rica. In this brake the cut-off and exhaust of the brake cylinder pressure is controlled by the action of the brake cylinder pressure and the train pipe pressure on the one hand and the auxiliary reservoir pressure on the other hand, each acting on a suitable flexible diaphragm. A governing or a triple valve is provided with an auxiliary diaphragm, subject to the pressure in the brake cylinder, to assist the pressure of the train pipe acting upon the principal diaphragm of the ordinary valve in controlling the supply and discharge of the cylinder, for the purpose of maintaining in the cylinder any desirable pressure. Another invention, for which also a patent has been granted the same inventor, relates to automatic air brakes in which the brakes are set by a reduction of the pressure in the train pipe. This invention provides an improved triple valve by which the brake cylinder may be supplied with air at the full auxiliary reservoir pressure or any part of that pressure, any loss due to leakage when the brakes are set being restored from the auxiliary reservoir pressure, the valve being used in connection with a reservoir of such size that the pressure in it does not noticeably fall by the loss of one charge of air to the brake cylinder. The triple valve has an auxiliary governing piston connected to and moving the main governing piston of the valve, the cylinder of the auxiliary piston being connected by proper ports with the brake cylinder.

CAR COUPLING. — William P. Clark, Elberton, Ga. This improvement is designed to afford an extremely simple and efficient device, easily secured to a car, and enabling the cars to be automatically coupled, which may be operated without danger, and can be readily converted into an old fashioned coupling if necessary. It consists of a hollow drawhead in which is pivoted a protruding latch with beveled head and a side recess, a locking pin with an inclined shoulder on one side being held to move vertically through the drawhead, while an adjacently mounted crank rod has a crank connection with the locking pin. The coupling is practically a double one, and should one of the latches be broken by a strain, the other one would hold to prevent the separation of the cars.

RAILROAD SWITCH.—Clifford E. Nowlin, Battle Creek, Mich. This switch is designed to be conveniently operated from an engine or car to facilitate the switching of trains and allow them to make a siding quickly and with perfect safety. The switch rails are supported by a movable switch plate to which are secured cables extending parallel with the track and extending over guide pulleys and sprocket wheels, above which are mounted spring-pressed castings, connected with the sprocket wheels by a pitman and crank. Side rails arranged parallel with the track are pivoted to the castings, and means are provided for depressing the side rails from the train, the mechanism consisting of a sleeve on the locomotive in which is held a spring-pressed shaft carrying a contact wheel, there being a cushion for the shaft and a screw mechanism for adjusting it.

Mechanical Appliances.

FLAX HACKLING MACHINE. — John Erskine, Wolfhill Mill, Ligoniel, near Belfast, Ireland. This invention consists principally of a nipping device for ending the flax or fiber, a finishing hackle operating on the fiber in conjunction with the nipping device. The fiber holder has a vertical sliding motion, and gripping or clamping plates open and close on the ascending and descending of the holder, clamping the fiber held by it, the nipping device below the clamping plates consisting of two revoluble rollers adapted to pass the projecting fiber for ending it. Combs operate to comb the fiber when the holder ascends, brushes operating in conjunction with the combs, while tow catchers arranged below the combs remove the tow or combings.

WOOL CARDING MACHINE. — David Lamson, Elmira, N. Y. In this machine the parts are arranged around the main cylinder in a manner designed to rapidly and nicely straighten the fibers without any unnecessary work, and so that each part will give a forward motion to the stock operated upon, delivering it in good condition, with a material saving of labor, to the doffer. A licker-in is placed in advance of the main cylinder and a doffer is placed behind it, a tumbler and fancy being disposed one above the other between the licker-in and the main cylinder, a worker arranged between the tumbler, fancy and main cylinder, and a series of workers and strippers arranged around the upper part of the main cylinder, the workers being placed in advance of the strippers.

PUNCHING MACHINE. — Robert H. Ireland, New York City. A punch especially adapted for punching plate iron, beams, channels, and other structural shapes is provided by this invention. The machine can be controlled to carry the punch to engage with the article or to reciprocate above without engaging with it, as the operator may desire. The frame has upper and lower girders separated by transverse blocks, the lower girders carrying a table and there being a stationary casing in which is journaled a crank shaft between the upper girders, a block in the casing having vertical movement and having an opening through which the crank arm of the crank shaft passes. The blocks are adapted to receive a punch, a frame sliding vertically in the opening of the block, while a block sliding laterally in the frame has a pivotal connection with the crank arm of the crank shaft. The machine is designed to accomplish the operation of punching as rapidly as the pull rod can be drawn outward.

SAWMILL ATTACHMENT. — Thomas J. Williams and Tiberis S. Murray, Ironton, Ohio. This attachment is designed to be conveniently applied to any kind of a circular, band, or veneer sawmill, to enable the mill to rapidly and accurately saw beveled lumber, as weather boards, shingles, etc. On the front face of a frame adapted to be connected to the sawmill carriage is a rock shaft on which a series of sawmill dogs are mounted to rock with the shaft, the dogs having adjustable teeth projecting beyond their front faces to grasp the timber to be sawed, while the frame is provided with means for rocking the shaft and its series of dogs. The thickness of the beveled strips is regulated by adjusting the sawmill head blocks in the usual way, and different adjusting shafts may be used with the attachment to regulate the bevel of the strips.

HAMMER.—Arthur Chambers, Williams Bridge, N. Y. The head of this hammer has a side opening extending through to the eye and having beveled walls, and an elastic or slightly elastic plug of rubber or leather or similar material is fitted in this opening, the inner face of the plug being beveled, and the handle securing the plug in position. This forms a hammer having a side striking face with some elasticity, and combines in a measure a mallet and a hammer without diminishing in the least the adaptation of the hammer for its usual work.

Miscellaneous.

OXIDES OF METALS MANUFACTURE.—William H. Birge, Franklin, Pa. This invention provides an improved apparatus for manufacturing oxides from readily oxidizable metals at a low cost. A nozzle comprising a disk extending into a spraying recess has a central aperture for the passage of molten metal to the top of the disk, a hot air blast connection leading to the recess under the disk. As the apparatus is arranged, an air compressor is not required for forcing the necessary amount of air into the oxidizing chamber, only such force of hot air blast being required as is necessary to spray the molten metal on top of the disk and force the sprayed metal up into the oxidizing chamber.

RIFLE SIGHT. — Robert W. Parker, Camp Huachuca, Arizona Ter. This device has a base adapted for attachment to a barrel and a supplemental base moving transversely on the main base, a vertically swinging sight leaf provided with a projection extending at right angles therefrom and having a peep hole for use when the leaf is swung down. The base has a vertical portion at its rear, on the front edge of which is a series of gauge marks to serve as a wind gauge, and indicate the degree to which the supplemental base should be moved to one side or the other. The sight is designed to be easily brought to any desired adjustment to enable the rifle to be quickly and accurately aimed.

CAPODASTRO. — Henry Dahlman, Cambridge, Minn., and Theodor Blomgren, Stanchfield, Minn. This invention consists of a cushioned plate adapted to extend across the strings on the neck of the instrument, a yoke pivotally connected with the plate, a clamping arm pivoted on the yoke and adapted to engage with its free end the under side of the neck, and a hand lever to press the arm into contact with the neck of the instrument. The device can be quickly and conveniently placed and locked in position, and is designed to uniformly hold, quickly tighten, and shorten the vibrations of the several strings on the neck of the instrument whenever it is desired to raise the tone to a higher key.

WATCH IMPROVEMENT. — Roswell E. Moreland, Trenton, N. J. This invention provides a stem winding and setting mechanism in which the winding pinion is capable of both a rotary and end movement, remaining in gear with the crown wheel in any position. Means are also provided whereby the winding stem or arbor may be expeditiously and conveniently attached to the winding pinion, the entire mechanism being so constructed that the pendent setting is operated independent of any attachment in the case, and can be attached to any ordinary winding stem or arbor, such as commonly used in stem-winding watches.

SHEARS.—Anton Prohaska, Hoboken, N. J. The cutting blades of these shears are preferably made of sheet steel, by stamping or otherwise, while the handles are preferably of cast metal. A spring plate, held in position by a screw screwing into a pivot integral with one of the members, presses the cutting edge of one blade on the cutting edge of the other, so that a fine cut can be made at all times, and the cutting edges are self-grinding.

ROW BOAT FOOT REST.—John J. Sherman, Traverse City, Mich. This device consists of a central stationary inverted T shaped rail secured longitudinally in the bottom of the boat, and a sliding transverse foot board adjustable on or along the upright web of the rail, the whole forming a center slide adjustable foot rest or brace. By the support of the foot board upon the central rail in the bottom of the boat, the pressure of the feet is more directly conveyed to the center or keel line of the boat instead of to either side, making the steering easier, while the central fixed rail forms ballast in the bottom of the boat.

GATE HINGE.—Gabriel Rohrbach, Del Rio, Texas. The improvements shown in this invention may be applied to any swinging gate, but they are specifically adapted for use in connection with gates for yard and park inclosures, the hinges being adapted to hold the gate in open position. The hinge consists of two brackets having overlapping leaves and having a pintle connection, the leaf of the bracket attached to the gate having inwardly inclined slide flanges, in combination with two spring hooks adapted for attachment to the gate post and to engage the flanges. The gate when hung normally rests in closed adjustment, owing to the relative inclination of the bearings or leaves on the hinges, but when the gate is opened in either direction it is slightly elevated, and will close with a slight impetus.

DOOR SECURER.—Columbus F. Cardwell, Bridal Veil, Oregon. This device consists of a plate formed at one end with a toothed angular arm adapted to engage the door jamb, bearings being formed on one side of the plate in which slides a bar having an angular arm extending from its inner end and having notches in its outer end to engage the outer bearing, a brace being pivoted to the plate on the opposite side from the bar, and the brace having points to engage the door jamb or casing. This fastener is designed for ready and temporary attachment to any door for securely locking it, and may be folded up for conveniently carrying it.

CASTER.—Caughey S. Fleming, Shelbyville, Ind. This invention relates to two-wheeled casters for furniture, trucks, etc., providing therefor a caster capable of tilting in its support, thereby enabling it to more readily ride over obstructions. The spindle or support has a horizontally ranging member on which is a loose sleeve, the axle of the wheels passing through the sleeve and spindle, while the axle has its bearing in the sleeve and is capable of tilting with it independently of the supporting spindle.

HARNESS.—William H. Violett, Grand Junction, Col. By this invention a snap connection is provided at one end with a hook to engage the neck yoke ring and at its other end with a loop and a hook adjacent thereto, there being a double spring tongue for closing the hooks, and one of the holdbacks being secured in the loop and the other in the adjacent hook. By this improvement the wear on the holdback strap resulting from its sliding back and forth in the yoke ring is avoided, and the connection with the yoke may be easily and quickly made.

SLING CINCH.—Denis O'Sullivan, Spokane Falls, Washington. This is a device for securely fastening packs upon the pack horses, mules, and burros used in mountainous countries, and permits the pack to be quickly and securely attached and as easily removed when desired. It is composed of a strap having at one end a metal fastening consisting of a hook having a lateral outlet, with an anti-friction roller in the bend of the hook, a cramping pawl closing the outlet and having at its other end a plate or attachment provided with an offsetting eye.

ANIMAL SHEARS.—Charles and Harry Burgon, Malin Bridge, near Sheffield, England. This invention relates to improvements in instruments for shearing or clipping sheep or other animals, having for its object to enable the crosshead or forked end of the vibrating lever, by which the reciprocating motion is imparted to the upper cutters, to adjust itself freely to the plane of the cutting surface of the lower cutters, upon which the upper cutters work. An improved means is also provided of applying pressure to the upper cutters, to maintain a constant steady pressure sufficient to insure efficient cutting action without requiring great nicety or care in making the adjustment.

PNEUMATIC TIRE.—William R. Foster, Bermondsey, England. A tubular tire with closed ends wrapped around the wheel rim, the ends tapered to lap over each other and make a scarf joint, is combined with a jacket or cover in the form of a complete annulus of nearly tubular cross section, but with a slot extending around its inner circumference, the jacket being adapted to envelop the tire and its edges, and being detachably secured at intervals to the back of the wheel rim. With this improvement the tire may be readily removed and replaced by another in case of injury without entirely removing the cover of the tire from the wheel, and without dismounting the wheel from the machine.

TEMPORARY BINDER.—Adolph A. Hunziker, St. Louis, Mo. This is designed to be a simple and efficient binder for temporarily binding magazines, loose pamphlets, blank books, etc. To the back support to which the covers are attached, at one end, are fixed hooks adapted to be entered between the leaves of the pamphlet as the latter is placed in the binder, a spring-held double hook, sliding in guides, being at the same time drawn out from the other end of the back support, the pointed ends of the double hook when released entering between the leaves of the pamphlet at the other end.

ROLL PAPER HOLDER AND CUTTER.—George M. D. Manahan, New York City. This is an upright device in which upright cutter frames with attached knives are arranged down both sides of the roll, the frames being hinged to a yoke or frame, while cords and weights operate to keep the knives up against the roll and follow it up as draught is made on it. The apparatus, instead of being carried by a main frame, and standing by itself away from the wall or in the middle of the floor, may be set up against the wall as an attachment to save room.

KNITTING AND FORMING HOSE.—Frederick W. Simons, Philadelphia, Pa. This invention provides an improved method whereby the sock or stocking has its heel, foot, and toe knit continuously on a circular knitting machine without removal, transfer, or addition of any fabric knit on any other machine, the heel being knit continuously with the foot, and afterward cut, readjusted, and looped together. Any ordinary circular seamless knitting machine suffices in carrying out the invention.

GAME BOARD.—Edgar L. Williams, Rochelle, Ill. This board consists of a case having pins of uniform size grouped in opposite ends and projecting vertically from the bottom, a taller pin being arranged between the groups of pins, and sliding lids held in the upper portion of the case, in connection with a series of rings to be thrown upon the pins. The game to be played on the board is designed to afford amusement to persons of all ages, there being enough elements of chance about it to make it interesting and exciting.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention and date of this paper.

NEW BOOKS AND PUBLICATIONS.

GEOLOGICAL SKETCHES AT HOME AND ABROAD. By Archibald Geikie, LL. D., F.R.S. With illustrations. New York: Macmillan & Co. 1892. Pp. x, 332. (No index.)

The delightful story of what Professor Geikie considers the turning point in his life, his first geological excursion when a mere schoolboy, opens the present attractive work. We then travel with the distinguished author over Scotland, England, France, Sweden, and America, with most fruitful results. The subject is presented from the more popular side, and gives a graphic aspect of the world's history as pictured in the mind of a leading geologist. The work is largely a reprint of scattered essays, and will be a welcome addition to the general as well as scientific library.

HEROES OF THE TELEGRAPH. By J. Munro. London: The Religious Tract Society. Fleming H. Revell Co., New York and Chicago, sole agents. Pp. 288. Price $1.40. (No index.)

The lives of Wheatstone, Morse, Sir William Thomson and other notabilities in the electric world, past and present, are treated seriatim in this work, with many portraits of the subjects of the memoirs. It is a graceful tribute to the practical world's workers in electric science, to those who have shown how closely interconnected theory and practice may be.

DEAFNESS AND DISCHARGE FROM THE EAR. By Samuel Sexton, M.D., assisted by Alexander Duane, M.D. New York: J. H. Vail & Co. 1891. Pp. 89.

The treatment of the ear for its troubles by the more radical methods of treatment, based upon modern surgical methods, is advocated by the two authors of this short manual. Dr. Sexton appears as a strong advocate of these methods, and a number of cases successfully treated are detailed.

METHODS OF GAS ANALYSIS. By Dr. Walter Hempel. Translated from the second German edition by L. M. Dennis. London and New York: Macmillan & Co. 1892. Pp. xv, 384. Price $1.90.

Dr. Hempel's methods of gas analysis have won for him a place comparable with that of Professor Robert Bunsen. The introduction of his absorption pipette really marked a new step in the difficult work of accurately analyzing commercial gases. The present man-

osi, with its very numerous and elegant illustrations-tables and general data, is about the most important addition to the literature of the subject since Bunsen's work was published. The earlier book marked the creation of an exceedingly accurate standard analysis that has never been displaced and has hardly been improved in the many years since it was published. The present book describes the far quicker and almost as accurate methods first introduced by Dr. Hempel. The work in every way is a worthy presentation to the English-speaking gas engineers and chemists of Hempel's classic researches.

DIE PRAXIS DER MOMENT-PHOTOGRAPHIE AUF DEM GEBIETE KUNSTLERISCHER UND WISSENSCHAFTLICHER THAETIGKEIT. By L. David and Charles Scolik. 12 plates. 449 illustrations. Pp. 459, text. Wilhelm Knapp, publisher, Halle a. d. Saale, Germany. 1892.

This publication, printed in German, treats in a very comprehensive manner on the practical workings of instantaneous photography and the results obtained thereby relative to artistic and scientific research. The volume is divided into sixteen chapters, which give a complete description of the present state of the art, and with the help of 16 plates—reproductions from original photographs—fully illustrate the results obtained by the best apparatus and methods in use. The various apparatus and the practical arrangements necessary for producing good work are amply illustrated and described in an excellent manner and testify to the authors' thorough knowledge of the subject under consideration. The chapters treat on the results obtained by instantaneous photography, cameras, objectives, shutters, methods for measuring exposures, means for obtaining correct exposures, finders, illumination of objects, production of negatives, methods for obtaining series pictures, the stroboscopes or instantaneous figures, instantaneous pictures of various kinds, including projectiles, sound waves, balloon photography, lighting, etc., detective cameras, stereoscopic apparatus, and selection of detective or hand cameras.

THIRTEENTH ANNUAL REPORT OF THE BUREAU OF STATISTICS OF LABOR AND INDUSTRIES OF NEW JERSEY. For the year ending October 1, 1890. Trenton, N. J.: The Trenton Electric Printing Company. 1891. Pp. xvi, 474.

SCIENTIFIC AMERICAN BUILDING EDITION.

FEBRUARY NUMBER.—(No. 76.)

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1. Elegant plate in colors of a cottage at Short Hills N. J. Estimated cost, $5,000. Perspective elevation, floor plans, etc.
2. Colored plate illustrating a cottage at Great Diamond Island, Me., erected at a cost of $900, complete. Floor plans, elevations, etc.
3. A residence at Portland, Me. Cost, $11,000 complete in every respect. Floor plans, perspective elevation, etc.
4. The very attractive residence of E. T. Burrows, Esq., at Portland, Me. Cost, $9,500 complete. Perspective elevation, floor plans, etc.
5. A dwelling at Augusta, Me., erected at a cost of $3,200 complete. Floor plans and perspective elevation.
6. A handsome dwelling at Carthage, Ill., designed in the style of modern Romanesque. Cost, $8,000. Perspective and floor plans.
7. A residence colonial in treatment and recently erected at Belle Haven, Greenwich, Conn., for Mr. Chas. A. Moore, at a cost of $14,000 complete. Two perspective elevations, floor plans, etc.
8. A colonial residence recently erected at Brookline, Mass., at a cost of $18,000 complete. Wm. T. Sears, architect, Boston, Mass. Perspective elevation and floor plans.
9. An architect's home, with sketches showing the hall, drawing room, terrace, entrance front, dining room, together with ground plan. A thoroughly cosy, comfortable, and complete dwelling.
10. Sketch for a suburban chapel. Submitted by O. M. Hokanson in the St. Paul Architectural Sketch Club competition.
11. View of the Washington Street tunnel at Chicago.
12. Miscellaneous contents: Architecture and poetry.—Waterproof wall coatings.—Colored woods.—The planning and construction of American frame houses.—Church spires.—Ownership of plans.—Simplicity in furnishing and decorating.—Utility and art.—Improved door hanger, illustrated.—The Madison Square Garden weather vane, the huntress Diana, illustrated.—Schmidt's window frame, illustrated.—Sackett's wall and ceiling board.—An improved mitering machine, illustrated.—A combination folding bath tub, illustrated.—Japanese interiors.

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Minerals sent for examination should be distinctly marked or labeled.

(4013) W. E. W. asks about crystallized boron, its demand and price per gramme or ounce. If there is a concern that makes a specialty of manufacturing it, would it be enough in demand to take the place of the diamond in some of its uses in the arts? A. Boron hitherto has been only a chemical curiosity. If produced in quantity it might have value, but nothing could be safely predicated concerning its introduction. It is said that it is harder than the ruby, or nearly equal to the diamond.

(4014) B. P. B. asks: Please inform me if at any period of the year the sun setting in Alaska will be rising in Maine. Also if the south pole is as cold as the north pole, and if a compass be taken below the equator, will it still point north? A. From the 10th of June to the 2d of July the sun shines on the most northern parts of Alaska during the whole twenty-four hours of the day, and during this time shines on Alaska near the horizon when rising in Maine. We have no means of knowing the difference in temperature at the poles. The probability is that the south pole is the coldest. The needle points the same or has the same polarity north and south of the equator, but dips in opposite directions; the north end dips in north latitudes, and the south end in south latitudes.

(4015) B. A. C. writes: I have constructed a telegraph line about a mile in length, but I am unable to tell how many batteries to use. There are only three stations on the line. Will you kindly give me information? A. The rule is to make the resistance of the battery equal to the resistance of the line including that of instruments.

(4016) A. D. D. asks: 1. What is the cause of the detonation when a fuse burns out in the fuse box of an electric car? A. The fusion is so sudden as to amount practically to an explosion. The noise is produced by the impact of the air, as in the explosion of a fulminate or of powder. 2. If the mechanism of the throttle valve in a locomotive should in any way get out of order, how could the engine be stopped at once, if running at the rate of about 20 miles an hour? Could the air brakes stop it? A. The engine could be reversed, or the reversing lever could be put in a central position, thus preventing the valves from acting and excluding steam from the cylinders.

(4017) J. S. writes: I have been making a magnetic key similar to one described in "Experimental Science," Fig. 465, but cannot make it induce any noticeable current in a detector such as described on page 305. What points is it likely that I have overlooked? A. Possibly you expect too much from the key. Try it in connection with a magneto bell. If your magnets are strong, and if you have used a sufficient length of fine wire, the key should operate. 2. How and by what means can this key be made to give a shock? Should the circuit outside the key be of same resistance as the two bobbins, and should the terminals be connected to handles? A. Connect the terminals of your coils with handles formed of metal tubes. Moisten your hands when you take the shock.

(4018) W. Mc.P. asks: 1. What is the principle of the Babcock fire extinguisher? A. The large vessel is charged with water and sodium bicarbonate. Above it a corked bottle of sulphuric acid is supported. A short hose with stop cock and noozle connects with the liquid. To use it a handle is turned, breaking the acid bottle. The acid falls into the solution and sets free enough carbon dioxide to generate high pressure in the vessel, which is tightly closed. On turning the stop cock a jet of water is expelled which is a little more efficacious than ordinary water on account of the sodium sulphate dissolved in it and the carbon dioxide carried with it. 2. Do chemists in general believe that there is but one element? A. It is hard to say. William Crookes, of England, is one of the prominent believers in the original element or "protyle."

(4019) E. R. E. asks: Can you explain the phenomenon of a wagon or carriage wheel turning backward when it passes over an icy or slippery place? I have witnessed it many times, and to-day, as a heavily loaded coal wagon passed along, one of the rear wheels, as it touched a slippery place, several times reversed about one-eighth of a circle. I can easily see how it might stop when the friction of the tire on the ice or soft clay was less than that of the hub on the axle, but why should it rotate backward? A. The only explanation we can make is to suggest that the wheel was not round or a perfect circle or that the axle was not central, when in very slippery places it would slip forward or back upon its shortest radius.

(4020) F. H. R. asks: What amount of electric current would be required for heating 100 feet of No. 30 German silver wire up to 212° Fah.? A. 0·63 ampere, requiring a difference of potential of 59 volts for its maintenance. These figures are necessarily only approximate.

(4021) J. S. H. asks for the method of finding the mantissæ of logarithms. Most mathematical works on the subject of logarithms state the use of tables of logarithms, but not the construction. A. The original calculations of Briggs and his collaborators are still at the basis of our tables. The calculations are very laborious and cannot be explained within our limits. In the Encyclopedia Britannica, 9th edition, vol. 14, page 777, you will find the explanation desired.

(4022) C. H. M. asks: 1. Has there ever been any theory advanced in respect to the significance of Bode's law for planetary distances? A. Bode's law is only an approximate relation, and breaks down in the case of Neptune. It is regarded as a mere coincidence, there being no reasonable explanation of its numerical relation to the distances of the planets. 2. What is the explanation of the fact that whirlwinds are in their direction of gyration contrary to watch hands in the northern hemisphere and in direction of watch hands in the southern hemisphere? Is it attributable to magnetic influences? A. The equator is the central line dividing the relative directions of the winds and whirlwinds in the northern and southern hemispheres. The motion of the earth is the cause of the general circulation of the winds. Hence the northern and southern influence will be alike, as illustrated in the trade winds, which blow westerly and toward the equator in both hemispheres. The same conditions that produce the whirling storms are alike both north and south of the equator. Hence they must rotate in reverse order. 3. Suppose the earth to be of homogeneous material and of its present dimensions and density, where then would be its densest portion? Would it be on a spherical plane taken at one-fourth its diameter? Its density would be *nil* at its center; then its densest portion would fall somewhere between its center and its circumference. A. The densest part of the earth would be at the center, from the pressure of the surrounding mass under the influence of gravity, but the force of gravity would disappear at the center. 4. Is it not true that if there were mechanical motion enough in the universe, gravity would be annihilated? As centrifugal force overcomes gravity, then gravity must be the result of insufficient centrifugal motion. If there were sufficient force—motion—to atomize and distribute all the matter of the universe equally in space, gravity would be extinguished, would it not? A. Gravity is a constituent of all matter and cannot be annihilated. It is the force of gravity that has brought the universe out of chaos.

(4023) W. E. S. asks: 1. What is the difference between the electricity used for illuminating purposes and static electricity generated by friction and collected in a Leyden jar? A. Static or, more properly, frictional electricity has a very high E. M. F. with very small amperage. Whereas electricity generated by dynamos and batteries has E. M. F. varying from a few volts to several thousand, but always with more amperage than electricity produced by friction. 2. Is it galvanic or static electricty used in executing criminals in the State of New York? A. Galvanic or current electricity.

(4024) W. P. B. asks: Can you please give the value in cubic feet and in gallons of the statute inch of water of Colorado and of California? Also same values for the miner's inch. A. We do not know of a "statute" inch of water. The name indicates that it is a State law. An inch of water as described in deeds of water privilege and approved under court practice in various States is the quantity that will flow through a 1 inch square hole in a given thickness of plank under a given head, 2 inches and 1¼ inch being the usual thickness. The usual head is 4 feet, but various heads are specified. The miner's inch most used is a 1 inch square hole through a 2 inch plank, with its center 6¼ inches below the surface, and is equal to a delivery of 1·57 cubic feet per minute, or 11·77 gallons. The head varies somewhat among different water companies in California, as 9 inches head, 7 inches head, 6¼ inches head, all measured from the center of the opening.

(4025) J. C. F. A. asks: If the ordi- nary steam engine only produces in power about 20 to 25 per cent of the energy of the coal, how is the loss of 65 to 70 per cent divided between the boiler and engine? How much of the theoretical force of steam is lost in converting it into power through the ordinary high pressure engine? A. In ordinary boilers from 20 to 25 per cent of the fuel passes up the chimney. Of the balance, from 8 to 10 per cent is utilized in ordinary high pressure engines. In condensing and compound engines, 11 to 12½ of the total heat units may be realized.

(4026) F. W. S. asks: What amount of pure gold is required to be added to raise 100 dwt. of 18 karat gold to 20 karat gold. Please give rule and example. A. Your 100 dwt. of 18 carat gold contains 75 dwt. fine gold and 25 dwt. alloy. To bring this up to 20 carat, you must add enough fine gold to make the proportion of one-fifth or five times the alloy, which is 125 to 25, or add 50 pennyweights to your 100 of 18 carat, or 50 per cent.

(4027) G. L. H. asks: 1. How many cells of the Fuller battery will be required to run the simple motor No. 641? A. It will require about 20 cells. This battery however is not very well adapted to the motor referred to, on account of the small zinc surface. 2. How long will batteries run steadily with one charging? A. Owing to the low resistance of the motor, the battery would probably run down in two or three days. 3. Could I make them in the form of the large plunge battery, using a number of wooden boxes painted with P. and B. battery compound? A. Yes. 4. What book will give me the different resistances of wires in copper, German silver, etc.? A. Sloane's "Arithmetic of Electricity," $1 by mail, contains this information. 5. Where can I find the arithmetic of dynamos and motors, that is, the relative resistances of the armature and field, also the winding of machines to conform to circuits of different E. M. F. and amperage? A. In the above named book and in Hering's "Dynamo-Electric Machinery," $2.50 by mail.

(4028) Inquirer writes: I am interested in Mr. Wightman's method of fixing the paste for the positive plates of storage batteries. Now, will he kindly write again and explain best method for the negative plates?

(4029) W. J. A. asks: What is the ac- cepted theory as to the origin of the salt in the ocean? And is it increasing or diminishing? A. It is generally conceded that the saltness of the sea was at first partially derived from the combination and precipitation of the vapors of its constituents during the earliest of the geological ages, and that the disintegrated azoic rocks continued to furnish the chlorine and sodium in gradually lessening quantities, which during the present age is said to be scarcely perceptible by analysis.

(4030) M. A. L. says: Would be pleased to have you state the composition of the strongest known castings. The tensile strength of same. Also, supposing a tubular steel shaft 2¾ inches diameter outside by ¼ inch thick by 2 feet long, resting in a suitable bearing, and a pulley 4 feet diameter attached to each end, one pulley made fast. What safe working load could be suspended on the circumference of the other pulley? What load would it take to break the shaft? The same in composition. The same with a solid shaft 1¾ inch diameter in steel and composition. A. Nickel steel is claimed to be the strongest metal. Tensile strength about 100,000 lb. per square inch. The steel hollow shaft will break with a load on the pulley from 900 to 1,000 lb., according to quality of steel. A solid steel shaft 1¾ inch, about 3,500 lb. The composition shaft, 2¾ inches, ¼ inch thick, about 150 lb., variable according to composition and hardness.

(4031) Reader, Selma, Ala., asks why the drift wood keeps in the center of a rising stream, and why it goes to the banks when the stream begins to fall? A. The high and steep banks at Selma retard the stream at its edge and cause a whirl that sets the surface toward the center of the stream during high water. As the stream falls, the current becomes slower and more under the influence of the bottom, when the drift wood begins to spread toward the banks.

(4032) G. L. F. asks: 1. How much pressure per square inch will a boiler stand, of following dimensions: diam., 12 to 14 inches; thickness of shell, 1-8 to 3-16 inch; about 3 feet long, with locomotive type fire box? Boiler well riveted. A. It is a very slim basis upon which to judge of the pressure that your boiler will carry from the data that you give. The strength of the cylinder may be satisfactory, but the locomotive fire box is an unknown quantity in all its details, and this is the life of the boiler. If the fire box is as strong in proportion as the cylinder and properly stayed, it might be safe for 50 lb. working pressure. 2. In firing boilers with petroleum, which is best—a steam or hot air blast? A. You should have an air blast to start with; after steam is up, the steam blast is most convenient and proper. 3. Can the hand power dynamo illustrated in "Experimental Science" be made to run one 16 candle power electric light, by using power to run dynamo? If so, what wire should be used on armature, etc.? A. It will not. Two 6 candle power lamps connected in parallel can be run by it.

(4033) C. E. T. says: Can you tell me the reason why the pipe leading to a steam gauge of boilers has the coil of pipe? Is there any advantage in it, or is it there for looks, or some other less important reason? A. The coil is essential to preserve the interior of gauge spring from contact with the steam, which injures the gauge. The coil gathers water by condensing the steam and makes a seal between the air in the spring and the hot steam.

(4034) J. McD. says: When the hot water faucet at sink is opened, a great rattling noise is produced in boiler, which is of copper, 40 gals., and continues until faucet is shut off again, then producing a sudden sharp click in boiler; all is quiet until hot water faucet is used again, when the above is repeated; pipes to water back in range are all run correctly and are not trapped. Hot and cold water pipes run down from sink, then under kitchen floor, 20 feet horizontally, then vertically 40 feet to other fixtures, remaining separate all the way and not joining at top. Can you suggest a remedy? A. The noise is caused by the sudden vibration of steam in the water back, caused by the reduced pressure in the water when the faucet is opened. The steam rushes into the boiler through the circulating pipe, where it comes in contact with the cooler water, and suddenly condenses with a hammering noise. A larger cold water inlet pipe from the street, and an air chamber, will be a partial remedy; perhaps the street pipe is partially closed, which is often the case where galvanized pipe is used. This will cause the hammering.

(4035) V. L. C. asks: 1. How to make a perfectly smooth dead black varnish for brass, etc.? A. A good black for brass consists of thin seed lac varnish (made by dissolving seed lac in alcohol) and refined lamp black. The varnish must be quite thin to insure a dead black, and it should be strained after the addition of the lamp black, to remove all lumps. 2. How to make a transparent dip varnish or lacquer for silver plated and gilt work (on metals)? A. Use a thin shellac varnish, made by dissolving white shellac in alcohol.

(4036) J. B. says: Kindly answer through SCIENTIFIC AMERICAN what causes clicking in pipes when steam is turned on? Give scientific explanation and remedy. Why would not it be a good idea in order to increase the speed of our fast boats, to have oil forced out at the bow and keel? This would naturally rise and envelop the hull, forming a film of oil for the boat to ride on, thereby reducing the friction of the water. Give a scientific explanation of how electricity makes a motor revolve. Give suggestions of some simple way of heating water closets in this cold climate. A. The noise in the pipes is caused by water hammer. The steam is rapidly condensed in the cold pipe, and is thrown against the pipes, elbows or bends by the velocity of the steam through them. The water also accumulates in small masses, which are dashed against each other; this in a confined space like a pipe produces a hammering noise. Your suggestion is good, but expensive. Air has been tried on a steamboat in New York Bay, but did not meet expectation. A motor is driven by maintenance of poles in the armature attracted or repelled by the field magnet poles. We suggest that you move the water closet into the house, or put up a stove.

(4037) W. L. asks: 1. Would a bar magnet be as strong magnetically if tempered hard only at the ends (say one-fifth of the length at each end) as it would be if tempered for the full length? A. Yes. 2. What are the ordinary impurities of aluminum? A. It is often alloyed with copper. 3. Action and reaction being equal, will a dirty gun "kick" any worse than a clean one, with the same charge? Also why do some powders produce less noise than others? A. No. Some powders burn progressively with less noise than suddenly detonating ones. 4. Is not linseed oil a good substance for water-proofing canvas boats? A. Yes. 5. Is the process of raising bread by means of hydrochloric acid and soda economical or healthful? A. It is not a safe one for unskillful or careless hands. 6. Is there any easy method of deodorizing skunk skins? A. It can be done by burying the skins in the earth.

(4038) E. D. asks: 1. Will an ampere- meter register equally as well on the positive as on the negative wire? A. Yes. 2. Will the same number of amperes that are delivered on the positive return on the negative? A. Yes. 3. What per cent of slip on dynamo belts is good practice? A. No slip.

(4039) E. E. W. asks: Will you please answer the following question: Is there anything (about 1-32 inch thick) I could place between a staple shaped magnet and a flat piece of steel to keep it from drawing? A. No insulator of magnetism has been discovered. Perpetual motionists have been looking for a thing of this sort since magnets were known. We fear they are doomed to disappointment.

(4040) C. H. F. asks: 1. Is light light before it reaches the atmosphere, or is it produced by transmission through the air? A. The atmosphere plays no part in the production of sunlight. 2. Does sound travel equally in all directions, or in a straight line from a common center? A. It depends much on the manner of producing the sound and the condition of the propagating medium. The sound from a bell hung in a clear space and surrounded by a quiescent homogeneous air can be heard equally well in all directions. 3. Is a person in an audience at twice the distance from a speaker able to hear better than one back of him (the speaker)? A. Yes. 4. Is heat produced by the transmission of light through the atmosphere, or does all light possess the quality of heat? A. The atmosphere is heated when acted on by ether waves, especially when it contains moisture. 5. Is the form of vibration of heat-producing light materially different from non-heat-producing light? A. They are probably the same, but there is no conclusive proof that they are. 6. Is all light convertible into heat on passing through a suitable lens? A. This is an undecided question.

(4041) E. F. L. asks: What is black manganese? For what purpose is it used, and what is its value? A. It is a compound of manganese and oxygen; its formula is MnO_2. It is used in batteries to a certain extent as a depolarizer, but its principal use is in the manufacture of bleaching powder. Its value depends on its purity and quality. It retails by the barrel at from 4 to 7 cents per pound, but in gross lots would bring far less than this.

(4042) A. B. C. asks (1) from what Glauber salt is obtained. A. *a.* By treating salt with sulphuric acid and distilling off the hydrochloric acid. It is also found native. *b.* By double decomposition of salt and magnesium sulphate at low temperatures. *c.* By roasting iron or copper sulphide with salt. *d.* By calcining a mixture of sodium nitrate and magnesium sulphate. *e.* It is a by-product of petroleum refining, but is not always utilized. 2. For what is it principally used? A. Principally in the manufacture of glass, ultramarine, and soda ash. 3. How much is annually used in this country? A. No reliable statistics are procurable, as a great part is made directly by those who use it. 4. Is it used for dyeing and in print works? A. Sometimes in wool dyeing.

(4043) F. T. K. writes: 1. I made a bat- tery of the Chaperon-Lalande type, by plugging a piece of two inch gas pipe in one end and fitting a cap to the other, through which I put the zinc (a ¾ inch x 6 inch rod) insulated from the pipe. Not being able to procure the oxide of copper, I made some by precipitating a solution of sulphate of copper with caustic soda. I placed the oxide of copper in the tube to the depth of about an inch. The battery would ring a small bell for a few seconds, and then all action would cease. What is wrong? A. Your trouble is due to the use of cupric hydrate instead of oxide. Make the oxide by heating thin copper plates to red heat in the air, and after cooling beat off the oxide and reheat until it is all oxidized. 2. At the railroad shops I am employed at they have a gas plant of the Pintsch system for lighting the passenger coaches. The gas for use in the coaches is compressed to about 14 atmospheres, and during compression there is a liquid condensed from it which the man in attendance calls hydrocarbon, which has won quite a reputation as a cure for rheumatism. What is this liquid and what do you think of it as a cure for rheumatism? A. The residue is a hydrocarbon of the oleffine or paraffine or some similar series. We doubt its therapeutic value.

(4044) T. H. B. H. says: We have a 20 horse engine, 30 horse boiler, ran two 60 saw gins, jet and pump, and until recently a friction pulley press. We have put in instead a "direct steam press," 30 inch cylinder. In pressing the bale, we make four charges, *i. e.*, put into the press a certain amount of cotton, "run up the press," and "dogs" for the purpose hold up the cotton thus pressed until more cotton is put in, and another charge or run-up is made. When making is the last or fourth charge, often the water is drawn out of the boiler from two gauges to less than one. What the danger, and how to prevent? The press factory sent a man here to adjust the press, and he condemns the dome system. Ours is 24 inches by 24 inches. His plan is to have a pipe 1¼ inch in diameter and four or five feet long inside of boiler, perforated with a number of ¼ inch holes, and to take steam from boiler by said pipe instead of by dome, arguing that the small holes in the pipe would not permit the water to escape from the boiler to the engine and press, as the large orifice, now in boiler for the dome, does. A. There is nothing wrong in the dome. The 1¼ inch pipe is too small, and would be nearer the water than the dome. You probably open the steam valve too wide and lift the water in the boiler. This is bad, and dangerous practice. Go a little slower in opening the valve, and no more than enough to fill the cylinder slowly. The 1¼ inch pipe from the top of the dome to the cylinder, with a 1¼ inch valve, would be preferable to a larger steam pipe and valve—anything to throttle the sudden outrush of steam which causes the lifting of the water.

(4045) E. E. B. asks: If a man with a rifle and one with a cannon are placed any distance apart within range, and both fire at the same time toward each other, the cannon ball to travel twice as fast as the rifle ball, the rifle ball penetrating the cannon ball all the time until it is brought back to the place it started from, does the rifle ball at any time come to a dead stop? Second, if a man is on a moving train, and he starts from the front and walks toward the rear, can it be said that he is going in two directions at once? Third, if anything is started in any direction, is it possible for it to return to the starting point on the same line, without stopping first? Fourth, does the pendulum of a clock stop in swinging back and forth? A. The rifle ball stops at the instant its motion is reversed. The man moves only in one direction. All reversing motions have a dead stop. The same with the pendulum.

(4046) H. M. asks: 1. What pressure per square inch is exerted by illuminating gas compressed to one-tenth its original bulk? A. Gas compressed will give about 135 pounds gauge pressure. 2. What is the limit of gas compression? A. There is no limit above the point of liquefaction. 3. Would one-sixteenth inch steel plate be strong enough to stand the pressure referred to in question one? A. Yes, if not over 1 inch diameter. 4. What is the difference in strength and also in weight between steel and aluminum? A. Aluminum has about one-third the tensile strength of steel, depending upon their quality. 5. As one horse power steam engine equals 33,000 foot pounds per minute, would this be the same as 550 pounds per second one foot high? A. Yes. The best results are about 21 cubic feet gas per hour per horse power. 6. What is the weight of a 100 horse power gas engine (Otto for instance) and how much gas per hour does it consume? A. Address the Otto Gas Engine Co., Philadelphia, Pa.

(4047) V. M. asks: 1. Are engineers licensed as to grade?—for instance, a man might be capable of tending boiler and the common slide valve engines, but not the high grade of Corliss. Could he procure license? A. There are no provisions for the granting of valid license to engineers, except under municipal regulations in cities. 2. What is a blister on a boiler sheet? How caused and where found? A. A blister arises from a scab or defective weld beneath the surface of the plate. This prevents the heat passing into the boiler at that point. The surface becomes overheated and expands the film of iron over the defective place, and in a short time raises a blister. It usually occurs on the fire sheet. 3. How is a pop safety valve adjusted? A. A pop valve is regulated by a screw at the top. 4. What is the best form of battery cell for medical purposes? A. Any ordinary cell can be used for producing the current of a medical battery. 5. How are the flues arranged in vertical boilers? A. See "Steam Boilers and their Construction," by Wilson, $2.50 mailed.

(4048) B. R. W. asks the construction of a battery in which saltpeter is used for the depolarizer. Is it a good closed circuit battery, or is it only suited for open circuit? What is the voltage and amperage? A. It is the ordinary Grove combination. A porous cup is used for the sodium nitrate solution, which is best acidified with sulphuric acid; in this cup is placed the negative plate. The positive plate of zinc, amalgamated, is in the outer vessel, which contains dilute sulphuric acid. There is nothing new in the combination. It gives 1·7 to 1·9 volts, and is an excellent open circuit battery.

(4049) L. S. G. says: Would like to know if you could let me know of some way to give small steel wire springs a good spring temper? Wire about the size of a 40 drill and 1¼ inches long. A. If you have a number of springs to temper, place them in a small sheet iron box with a little pulverized charcoal on the bottom and over the springs. Heat to a cherry red and tip the springs into the water. Dry and spread them on a wire sieve and dip in boiling linseed oil for 2 or 3 seconds and again cool in water. Another way is to slightly polish the springs after hardening and lay them in a flat pan and heat until a full blue color comes and then quickly cool in water.

A. Y. O. asks how to fine wine.—L. B. K. asks how to color brass a fine blue.—S. I. A. asks for a hair tonic or hair invigorator.—J. W. wants an iron paint.—Old Sub. asks: Will you oblige by giving the receipt for making the beautiful gloss that is found on collars and cuffs?—A. D. J. E. asks for receipts for making various kinds of matches.—H. D. H. says: How can I make a hektograph?—F. C. H. wants to know how to make hektograph ink.—C. H. asks (1) for a silver plating fluid for brass and steel. (2) A collodion for covering corns.—F. H. W. asks how to make a good glue mountant suitable for mounting photographs.—F. J. S. asks how to cure corns and bunions.—J. E. W. asks (1) for a good cement to splice belts with, (2) for a rust preventive.—R. V. H. wants to know a remedy for chapped hands.—M. D. asks for a lasting perfume, also for blonde hair dye.—R. H. W. wants to know how to make a depilatory for removing superfluous hair.—J. E. T. asks (1) for ink to use on typewriter ribbons, (2) carbon paper.—C. R. A. asks for a receipt for a hair invigorator.—J. F. F. says: Can you inform me how horn is dyed or stained in various colors?—H. M. A. asks the nature of the preparation used to clean wall paper.—G. A. M. says: Will you please give me (1) a formula for a combined toning and fixing solution, (2) for a hydrochinon developer, (3) how to preserve albumen paper?—A. P. asks: Can you inform me through the query columns of your valuable paper how to make a paste or glue for use in book binding, or how to use common glue so that it will not crack, as I have found it to do?—H. E. J. asks: Will you kindly inform me in what number I can find a receipt for the ordinary writing fluids used at the present time, or send me a formula?—C. D. asks: Would you have the kindness to advise me what publication to purchase that contains the information how to prepare solutions to do bronze, nickel, and silver plating with an electric dynamo?—H. R. S. asks: 1. Please give me a recipe for a waterproof glue to be used in putting the patch on a shipping tag. 2. Also a recipe for taking rust off fine steel tools.—C. N. F. says: Will you tell your subscriber how to make Roman candles?—J. J. says: Could you give me a sure cure receipt for perspiration of the feet. Sometimes in my daily walks they annoy me very much and the odor is very offensive. If there should be a cure for such an ailment, I know you would benefit me as well as others that may be afflicted with it.—I. B. says: Please be so kind as to give one of your steady readers a recipe to make glue so that water will not act upon it after it has been applied on wood or any other articles.—M. M. asks: What preparations are used in making typewriter ribbons?—A. A. F. says: I write to ask if you can suggest anything which, applied to one's hair, will take the stubbornness out of it.

Answers to all of the above queries will be found in the "Scientific American Cyclopedia of Receipts, Notes and Queries," to which our correspondents are referred. The advertisement of this book is printed in another column. A new circular is now ready.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

February 9, 1892,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Adjustable clamp for securing stands to various objects, C. E. Hudson 468,450
Aging and rectifying alcoholic liquids by ozone, apparatus for, Broyer & Petit 468,326
Air brake, J. B. Knudsen 468,387
Air brake, automatic, A. Silcock 468,701
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Terne plates, Morriston Tin Plate Company 20,704
Thread, linen, Finlayson, Bousfield & Co 20,705
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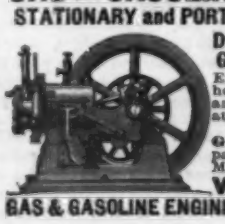
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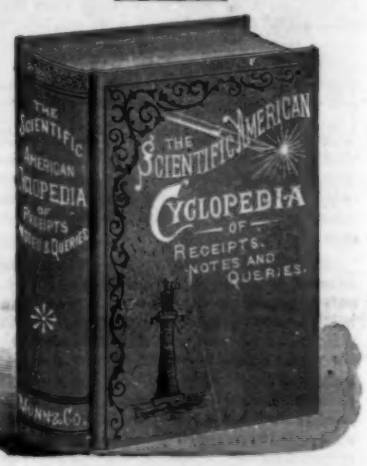

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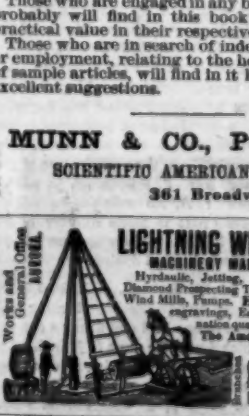
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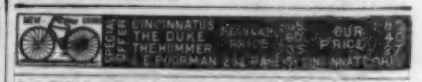

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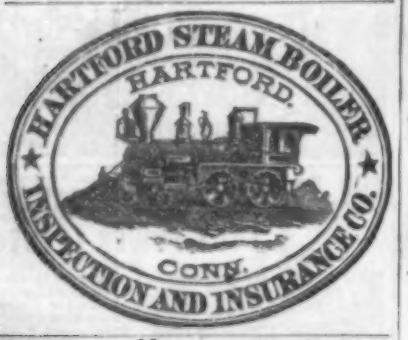

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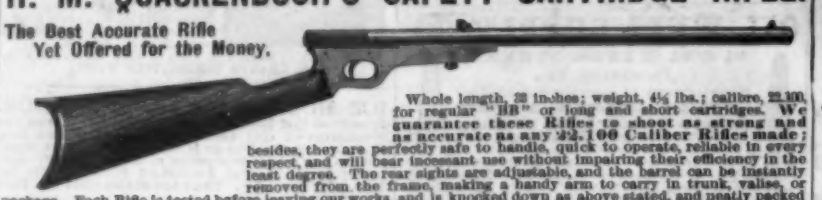

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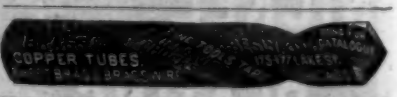

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